The American Farmer

E. J. Wickson.

Marshall P. Wilder

PRESIDENT OF THE AMERICAN POMOLOGICAL SOCIETY.

PRESIDENT OF THE NEW ENGLAND HISTORIC GENEALOGICAL SOCIETY.

E. J. Wickson

THE AMERICAN FARMER.

A

COMPLETE AGRICULTURAL LIBRARY,

WITH

USEFUL FACTS FOR THE HOUSEHOLD,

DEVOTED TO

FARMING IN ALL ITS DEPARTMENTS AND DETAILS, INCLUDING THE DAIRY, ORCHARD, VINEYARD, GARDEN, DOMESTIC ANIMALS, THEIR BREEDING, MANAGEMENT, AND DISEASES; BEES AND THEIR MANAGEMENT, FISH CULTURE, SILK CULTURE, ARCHITECTURAL DESIGNS FOR HOUSES AND OTHER FARM BUILDINGS, IMPROVED SANITARY CONDITION OF COUNTRY HOMES, ETC., ETC.

EDITED BY

CHARLES L. FLINT,

Secretary of the State Board of Agriculture of Massachusetts for twenty-eight consecutive years, and Author of "Grasses and Forage Plants," "Milch Cows and Dairy Farming," "Manual of Agriculture," Editor of "Harris on Insects," Etc., Etc.

Illustrated with over Seven Hundred Engravings.

COMPLETE IN TWO VOLUMES.

VOL. II.

"Two men I honor and no third. First the toil-worn craftsman, that with earth-made implement laboriously conquers the earth and makes her man's."—THOMAS CARLYLE.

"The city is always recruited from the country. The men in cities who are the centres of energy, the driving-wheels of trade, politics, or practical arts, and the women of beauty and genius are the children or grandchildren of farmers."—RALPH WALDO EMERSON.

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TO

HON. MARSHALL P. WILDER,

PRESIDENT OF THE AMERICAN POMOLOGICAL SOCIETY.

THE ENLIGHTENED AND LIBERAL FRIEND AND PATRON

OF

AGRICULTURAL AND HORTICULTURAL PROGRESS IN AMERICA,

This Volume is Respectfully Dedicated

BY

THE AUTHOR.

BIOGRAPHICAL SKETCH

OF

MARSHALL PINCKNEY WILDER.

By CHARLES L. FLINT.

Few men in our community have made a more striking, or a more durable mark than Hon. Marshall P. Wilder. Few have held more important public positions, or sustained themselves more honorably in them through so long a course of years. It has fallen to the lot of few men to initiate so many public enterprises which have enured to the benefit of the people among whom they have lived.

Born in the town of Rindge, N. H., on the 22d of September, 1798, he received his christian names from Chief Justice Marshall, and General Charles C. Pinckney, at that time prominently before the public as a distinguished Federalist statesman. His father, a nephew of the Rev. Samuel Locke, D.D., after whom he was named, was for thirteen years a representative in the New Hampshire Legislature; his mother, Anna, a daughter of Jonathan and Mary (Crombie) Sherwin, was a lady of great moral worth, to whom, no doubt, he owes many of the striking features of his character. His paternal grandfather was one of the seven delegates from the county of Worcester in the Massachusetts Convention, called to ratify the Constitution of the United States in 1788, who voted for its adoption.

At four years of age Marshall was sent to school, and at twelve entered the New Ipswich Academy, his father desiring to give him an education with reference to a profession. At sixteen, his father gave him the choice to fit himself for a farmer, a merchant, or for college. He chose the first, but the business of the store, which his father kept in the town, increasing, he was taken into that, where he soon acquired habits of industry, and developed such mental and physical energy that he was taken in as a partner at the age of twenty-one, and soon became postmaster of the town.

Conscious of a capacity for a wider field of action, he removed to Boston in 1825, and began business in Union Street, under the firm name of Wilder & Payson, afterwards Wilder & Smith in North Market Street, and finally set up for himself on Central Wharf. Forming a partnership again in 1837, he passed through several progressive steps to the well known and prosperous firm of Parker, Wilder & Co., now located in Winthrop Square. He is therefore the oldest commission merchant in domestic fabrics in active business in Boston. Though compelled, like all business men, to pass through various crises of commercial embarrassment, he has the proud satisfaction of never having failed to meet his obligations. With him success was a duty, and he had as a gift from nature that inherent energy of character, and devotion to the ruling idea of his life, to enable him to resist the allurements to ease and personal comfort, and to strive, not only for material prosperity, but for a higher and nobler object, to make himself useful to mankind. His business capacity and his executive ability were early recognized. He was one of the original directors of the Hamilton Bank, and has held that position for more than fifty years, and that of Director of the National Insurance Company for more than forty years, and of the New England

Mutual Life Insurance Company for nearly the same length of time, to say nothing of prominent positions in other similar institutions.

But Colonel Wilder was never wholly absorbed in the pursuits of trade, or the acquisition of wealth. His early tastes, and his love for rural pursuits, led him in 1832 to remove to Dorchester, and devote his leisure hours to the fascinating study of horticulture, and to experiments and investigations upon the land. His house, originally built by Governor Increase Sumner, was surrounded by extensive grounds, which he has brought by skill and taste to the highest state of cultivation, sparing no expense in the importation of seeds, plants, and trees, endeavoring by his example, as well as by precept and practical instruction, to instil into the public mind a love for labor upon the soil, and to elevate the standard of rural taste. His garden, his green-houses, and his forest trees and shrubs, filled up the time to be spared from other business, and gave ample scope for his favorite investigations, which he has continued, year after year, for half a century.

Soon after the formation of the Massachusetts Horticultural Society in 1829, Colonel Wilder was associated with General H. A. S. Dearborn, its first president, and from that time to the present he has been one of its most active and efficient members. The society early purchased the lands now known as Mount Auburn, for a cemetery and ornamental garden. Upon the separation of the cemetery from the society, in 1835, a change suggested by Colonel Wilder, committees were appointed, consisting of Judge Story on the part of the cemetery, and of Colonel Wilder on the part of the society, and though there were many difficulties to overcome, such was the skill and conservatism of Colonel Wilder, they were finally surmounted, and as a result, the society was soon able to erect an elegant hall on School Street, and subsequently the splendid building on Tremont Street, the most magnificent horticultural hall in the world. Chosen president in 1840, he held that responsible office for eight successive years. The hall on School Street was erected during his presidency. In his capacity as president, he headed a circular for a convention of fruit-growers, to be held in New York, October 10, 1848, when the American Pomological Society was formed and he was chosen its first president, an office which he has held to the present time.

In February, 1849, the Norfolk County Agricultural Society was formed, chiefly through the influence of Colonel Wilder, and he was chosen president, and delivered his first address upon agricultural education, the first general effort in that direction in this country. He held the position of president for twenty years. Soon after his first election to the office he issued a circular requesting a meeting, in convention, of delegates from the agricultural societies throughout the State to be held in September, 1851. This convention organized a Central Board of Agriculture, of which he was elected president and held the office till 1852, when it was organized as a department of the State, known as the State Board of Agriculture, of which he is still a member.

In 1863, the legislature incorporated the Massachusetts Agricultural College, in accepting the grant by Congress of public land scrip for the purpose, and Colonel Wilder was named first as one of its Board of Trustees. In 1852, chiefly through his influence, the United States Agricultural Society was established at a meeting held in Washington, and he was elected its president, a position which he held till the breaking out of the rebellion, when its annual exhibitions were necessarily discontinued.

Colonel Wilder took an interest, at an early age, in military affairs, and at sixteen was enrolled in the New Hampshire militia. At twenty-six he was commissioned Colonel of the Twelfth Regiment. This interest led him, soon after coming to Boston, to join the Ancient and Honorable Artillery Company. In 1856 he was chosen commander of the corps.

Though not a persistent aspirant for political honors, Colonel Wilder has not held himself aloof from public service. He was first elected a member of the legislature in 1839, as

a representative from the town of Dorchester. In 1849 he was elected a member of the Council of Governor Briggs, and the following year a member of the Senate and its president.

In January, 1868, Colonel Wilder was solicited to take the presidency of the New England Historic Genealogical Society, and was unanimously elected to the position, which he has since held with distinguished ability, delivering the annual addresses. Through his personal influence more than fifty thousand dollars have been raised to procure a new building for the use of the society, and to establish a fund for the support of a librarian. By his energy and untiring devotion to the interests ot the society, he has infused new life and vigor into its efforts for the public good, and given it a reputation and an influence which it never had before. It is safe to say that no one else could have raised it to its present prosperous condition, or given it its extended influence and character in the community.

The Hon. Paul A. Chadbourne, late president of the Massachusetts Agricultural College, in a recent memoir of Colonel Wilder says that: "The interest which Colonel Wilder has always manifested in the progress of education, as well as the value and felicitious style of his numerous writings, would lead one to infer at once that his varied knowledge and culture are the results of college education. But he is only another illustrious example of the men who, with only small indebtedness to schools, have proved to the world that real men can make themselves known as such without the aid of college, as we have abundantly learned that the college can never make a man of one who has not in him the elements of noble manhood before he enters its halls." His writings, public speeches, and addresses now amount to very nearly a hundred in number, and they have shown such marked ability that Dartmouth College, as a testimonial of his services in science and literature, conferred on him, in 1877, the degree of Doctor of Philosophy.

Colonel Wilder has been peculiarly blessed and happy in his domestic relations. What man could have accomplished so much who had not been? In 1820 he married Miss Tryphosa Jewett, of Rindge, a lady of great personal attractions. She died July 21, 1831, leaving four children. On the 29th of August, 1833, he married Miss Abigail Baker, of Franklin, Mass., a lady of many accomplishments and marked piety, who died, April 4, 1854, leaving five children. On the 18th of September, 1855, he married her sister, Miss Julia Baker, an accomplished lady, by whom he has two sons.

Colonel Wilder is a prominent public benefactor. If he had done nothing else but to introduce the Beurrè d'Anjou pear and great numbers of other new fruits and flowers, and to multiply varieties by hybridization, he would have laid the community under great obligations to him; but his range of activity has been far wider. A large part of the beauty, the cultured taste, and the luxuriance in landscape gardening, which cluster around and adorn the thousands of small homes about Boston, through a constantly widening radius, is due directly or indirectly, to his influence and inspiration. And now, at the age of eighty-four, from the calm retreat of his happy home, he can look back on a long life well spent, and out upon a region smiling with loveliness, with a consciousness that he is surrounded by a host of admiring and devoted friends, who can realize and appreciate the results of his labors, and the powerful impetus which his personal presence gave to the spirit of improvement, thirty, forty, fifty years ago.

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FOUR-YEAR-OLD SHORT-HORN STEER, "WM. ALLEN."

Winner of 1st prize at Fat-Stock Show, Chicago, 1879. Property of Wing & Thompson, Bement, Ill.

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THE AMERICAN FARMER.

PART III (Continued).

DOMESTIC ANIMALS.

CATTLE.

THE term cattle, in its primary and broadest signification, includes not only horned animals, but the horse, the ass, and nearly all those which have been domesticated. In a more specific and common acceptation, it is applied to the various races of domesticated animals which belong to the genus *Bos*, and is synonymous with *oxen*. Cattle seem to have been among the first animals domesticated by man in the early period of the world's history, as also the most valuable and necessary to his highest welfare in all ages and stages of civilization since that time. In ancient times an individual's possessions were determined by his herds, or rather by the number of his cattle, these being employed as a medium of exchange between different tribes and nations, a practice still common among many of the African tribes.

Naturalists have separated oxen into two classes or groups, the zebus or humped-cattle (*Bos indicus*), such as those of India and Africa, and the common widely distributed race with straight backs (*Bos taurus*). The original wild type from which the various breeds of domestic cattle are descended is not known. The principal and most valuable breeds in the United States have been derived from Great Britain, and other portions of northwestern Europe, especially England, where they have long been bred with such care that they have attained a degree of perfection not found in any other portion of the globe. The old native stock of this country are a mixture of various types, and cannot be classified as belonging to any particular breed. Great improvement has been effected, however, during the last quarter of a century, and even for a period considerably anterior to this, by importing the best pure-blooded animals of different breeds, and breeding therefrom both pure-blooded animals and grades. By this means choice, pure-blooded stock has become more common, and the native or mixed stock of the country has been greatly improved in many sections, while the great interest that is at present manifested in this important branch of agriculture augurs well for the future in this respect. The vast herds of cattle that roam over the extensive pampas of South America, Mexico, and other portions of the continent, are similar in the main to the domestic types to which they owe their origin; and since it is a law of nature for both plants and animals to revert to their original types when not interfered with by man, the conclusion to be derived is that these animals do not in their general characteristics essentially differ from the original source of our present breeds of cattle.

History of American Cattle. (See **Native Cattle.**)

Breeds and their Characteristics.—It is estimated that there are in Europe, at the present time, at least fifteen distinct British breeds, while the number of Continental breeds is considerably larger, all of which, according to Nilsson and Rutimeyer, who have given particular attention to the subject, seem to have been derived from three distinct species or races. It is not our purpose, however, to enter into a special description of these different breeds, as it would be neither advantageous nor practicable, being beyond the limits of this work; but we shall rather devote the space allotted to this department to the description and general management of those popular breeds which in Europe and America are noted for excellence in beef and milk production, or dairy use. With cattle, as with other animals, and also plants, climate, cultivation, nature of the elements of food that constitute the sustenance and perpetuate their growth, all have much influence in determining their form, size, and general character. While pure-bred animals have marked characteristics that distinguish them under all circumstances from other breeds, still the qualities that characterize them from others may be modified to a certain extent by a variety of circumstances, such as a change of climate, quality and amount of food, and the general management and care which they receive, particularly when young. There is also a constant natural tendency, as has been previously stated, to revert to the original wild state or condition, and this is only prevented by the careful management and that judicious treatment, which shall have a tendency to develop and increase the valuable qualities of the animal. When such a course is pursued through several generations of the same family, or race of animals, the qualities which it has a tendency to develop become after a time fixed to a greater or less degree, and are capable of being transmitted to the extent that they are peculiar to the race, and thus the permanent characteristics of the breed are established. We therefore have breeds suited to the special production of the largest amount of beef with the least offal or waste; those noted for their production of milk and cheese, others for butter, and others still whose chief excellence seems to be in their use for labor as working oxen.

Thus we have the heavy beef breeds oi early maturity in the Short-Horns and Herefords; the breeds noted as being producers of large quantities of milk peculiarly rich in casein, as the Ayrshires and Dutch or Hollanders; and those especially noted for butter production in the Jerseys, Guernseys, etc.; while the Devons have long been prized for their beauty, activity, and general utility as working oxen, besides possessing valuable qualities as beef and milk producers. While each breed has certain marked characteristics that distinguishes it from every other, still individuals of the same breed will be found to differ very materially, some possessing the desirable characteristics in a much greater degree than others; therefore, in breeding, those animals should be selected that most fully represent the qualities that are desirable to be transmitted.

While some breeds possess both beef and dairy qualities in a good degree, it will frequently be found that the breeds most profitable for beef production are, as a general rule, not profitable for the dairy, the latter qualities having been sacrificed to the production of beef, as is instanced in the Short-Horns, which were formerly very good milk yielders, but have deteriorated in this respect in the improvement of their beef qualities. The breed most profitable for the cheese dairy may not be the most profitable for the creamery or butter dairy, while the one that yields the largest quantity of milk may not be the most profitable for either, since the *quality* of the milk is of the first importance in determining its use for a specific purpose, while the breeds that would be most profitable for either of the above-mentioned purposes might prove very unprofitable for beef production. It would, therefore, be impossible to answer the question so frequently asked, as to *which breeds are the best?* since in selecting any breed the farmer must take into consideration the object to which it is to be devoted, the adaptation to locality, and other circumstances.

It may frequently be found best, as might be the case with the general farmer, to secure

as far as practicable a union and harmony of all the good qualities in the breed, and such as when ceasing to be profitable in yielding milk, will fatten readily, and bring a good price for beef in the market. In other cases the butter qualities will be regarded as most essential, and the selection should be made with special reference to this object. While the beef and dairy qualities are in a strict sense antagonistic, and therefore generally regarded as incompatible, they will be found to be combined in a much greater proportion in some breeds than others. Writers generally divide British breeds of cattle into four distinct classes: the short-horned, middle-horned, long-horned, and polled or hornless. The authority previously quoted says of these classes:

"They all have, or until recently, had their own various localities and districts in the several parts of England and Scotland, where they have existed from a remote period. Each were favorites among the farmers and breeders of their homes, rarely taken out of their districts, except for market, and until after the middle of the last century, like the people who reared them, strangers to other parts of the kingdom, and migrating back and forth no farther than to the nearest market towns, or district fairs. Thus they became homogeneous, deeply interbred among their own tribes, and closely retaining their own distinctive qualities, uncontaminated by the blood of other breeds, and transmitting their qualities and characteristics with a pertinacity and truth, of which those giving the subject little study can scarce realize. As such they have come to us, and only as such we know them."

The most numerous of the improved breeds in this country, are the Short-Horn, Devon, Ayrshire, Jersey or Alderney, while the Hereford, the Dutch, the Guernsey, and the Swiss, are found to a certain extent. Besides these the Brittany, Galloway or Polled, Kerry, and other less common breeds are occasionally seen.

Adaptation of Breeds to Localities. — It is very important, in order to secure the highest success in either beef production or the dairy product, that the selection of breeds should be made with due regard to locality and the attendant conditions; for while all the improved breeds have their peculiar characteristics and good qualities, some are much better adapted to certain localities than others, possessing in the abstract equal or perhaps superior qualities. For example, it will be found that in those localities where grass is not abundant, and pasturage poor, a small or medium-sized breed can be better sustained from such lands, and more milk in proportion to the food consumed be obtained, than from the largest sized breeds. In the great variety of our climate and soil, there will, therefore, be found localities more or less adapted to all our improved breeds, a fact that has been well set forth by one of the leading Western journals, in the following:

"All breeds cannot be equally appropriate for all places. Where food is scanty, and the land rough or hilly, the small breeds are undoubtedly best adapted to the situation. These are nimble in climbing steeps, and thrive on scantier herbage than the large-formed and heavy-bodied breeds. Such localities are better adapted to dairying as a speciality than beef growing; and here is a natural adaptation for the Ayrshire, Jersey, Guernsey, Devon, Kerry, and Swiss cows, or crosses of these upon mixed stock. As grain is not so largely raised here, special fattening for beef would not, perhaps, be very profitable; yet we always advise the joining of dairying and beef growing, so far as to make a proper use of all the calves, and of fattening the dry cows. In this case beef production is a mere incident to the main business of dairying — profitable in that connection, but not as separated from it. These breeds may be fed to a weight, in the cows, of 800 to 1,000 lbs., and the males from 1,100 to 1,400 lbs. at three years old, or 800 to 1,200 lbs. at two years old, and the latter system may be followed with profit. The refuse of the dairy will furnish a large portion of the food for the first six months, and, besides grass and hay, only a few bushels of grain or other food will be required to fit them for market. And as these lands are found principally in the Eastern States, all the beef, young or old, finds a ready market within a few miles of the producer.

Skillful feeding may grow and fatten these animals at a fair profit. These moderate-sized cattle, well fattened, are prime in quality, and will bring a full price. This will also improve the dairy system of the Eastern States, by utilizing all their products; and, besides producing much of the beef required in the local markets, will raise all the heifers necessary to replenish the dairy herd. This is matter of the greatest importance to the success of any proper system of dairying, as purchasing cows in a miscellaneous market is incompatible with the selection of an extra herd. This can be done only with home breeding, or the selection of a tried cow here and there.

We do not intend to say that in all parts of the Eastern States only the small breeds of cows are desirable — for quite the reverse is the case — but that these States furnish a large amount of land where these breeds are most appropriate. But when we reach the great Western plains, where the natural grasses grow in abundance, and where grain is produced with much less labor, here is the natural home of beef growing, and here the grandest animals are required to produce it most profitably. Here the mature bovine animals should weigh from 1,400 to 2,000 lbs., and be able to reach this weight at two and a half to three years old. Here your quiet, docile, large-eating and large-producing cow is the one required, since the largest machines pay best when you have the material to run them. That breed which will produce the largest amount of beef, milk, butter, and cheese in a given time, and from a given amount of food, is the one required. It has come to be acknowledged as a fact beyond reasonable controversy, that large cattle, of equally early maturity, produce the largest result in beef from a given amount of food; and, if of a milking breed, also the largest amount of milk from a given amount of food.

In England beef growing is never carried on singly, but milk is counted on as carefully as the meat; and, after a century of selection for the large milk dairies near London, and other large towns, the high-cross Short-Horn cow is used as the milk producer. This blood is there found satisfactory in milk production, as it is everywhere for meat production.

The Holland or Dutch cattle have a weight nearly equal to the Short-Horn, and have the great merit of having the milk secretions well developed and permanently fixed in the race. They feed into large, compact carcasses of beef, but are not as fine-boned and smooth as the Short-Horn, and many suppose them to have been the origin of Short-Horn blood. They are a fixed race, and transmit with certainty their characteristics to their progeny, and may, therefore, be used to improve the common stock for milk and beef. They are very large milk yielders, and will be of much advantage in building up the Western beef and dairy interest.

The Hereford is another large beef breed, having in this particular great merit; their advocates regarding them as fully the equal of the Short-Horn in early maturity, and as economical feeders for beef. As milk producers they have as yet little general reputation, either in this country or Europe. We have known a few fine milkers, which renders it highly probable that they may yet become developed in this particular, and that their general character in this respect may be owing to the fact that they have been kept mostly in grazing, and not in dairy districts. They possess remarkably fixed characteristics of race. No race is more prepotent; and when their milk yield shall be increased, they must be a most important addition to the beef and dairy breeds for the development of the West. The hardiness of this breed, and its adaptation to grazing districts, are unquestioned.

The West has not only abundance of grasses, but also abundance of grain, both for the production of beef and milk. This gives it all the resources requisite to the most assured success in the double enterprise."

In the selection of breeds for any purpose whatever, their qualities or characteristics should not only be considered, but the object to be secured in the enterprise, and the adaptation of the location to the attainment of the most successful results.

SHORT-HORN BULL, "2d DUKE OF NORTHUMBERLAND."
Property of A. Winslow's Sons, "Putney Stock Farm," Kankakee, Ill.

SHORT-HORNS.

THIS breed of cattle has without doubt been more popular and also more widely disseminated during the present century than any other, both in this country and Europe. Their history is too well-known to require repetition, being an old and well-established race. They were greatly improved and brought into general notice during the latter part of the last century, by the efforts of a few enterprising breeders in the valley of the Tees, England, and were formerly variously termed Durham, Teeswater, and Short-horn cattle. The counties of York and Durham were especially noted for these cattle, and in 1783 the Durham County Agricultural Society was formed, its first fair or "cattle show," as it was called, being held in 1784. The establishing of this agricultural society had an influence in stimulating the stock breeders of that time, since it inaugurated a demand for better stock and increased care in breeding. The Colling brothers, Robert and Charles, noted for the great improvements they effected in this breed, are mentioned as being exhibitors of Short-horn cattle at these early fairs, and also as being the first persons of that time who systematically fed and cared for their breeding stock, with a view to improving it to the degree of producing the best possible development; a new theory for that period. Since that time, great improvements have been effected in this breed, especially in the beef-producing qualities, which have been carried to the extent of deteriorating the milk-producing characteristics which they formerly possessed, and which is at present the aim of some breeders to endeavor to restore. Their chief merits at present, as a breed, evidently are in beef production, and they are most profitably bred for that purpose, since their milking qualities have unfortunately been so much neglected in breeding that generally the best cows for beef are very inferior milkers, and in sections in this country, where they attain the highest perfection in form and beauty, they are frequently not milked at all, the calf being allowed to run with its dam. Early maturity, symmetry of form, large size, with good fattening qualities are their chief characteristics. Specimens of this breed have brought at times enormous prices. Hon. E. H. Hyde of Connecticut says of them:

"They are celebrated all over the country for their large size and symmetrical beauty, and for the fabulous prices they have brought. There was a heifer calf of this breed sold in 1875 for twenty-seven thousand dollars,—more valuable, indeed, than the golden calf which Aaron set up for Israel to worship. It was the highest price ever paid for a year-old creature in all beastdom. This calf's mother and her progeny sold for over a hundred thousand dollars."

The Encyclopædia Britannica (vol. 1, page 388), contains the statement, that in 1873 the herd of Mr. Campbell, of New York Mills, near Utica, was sold at auction, at which time 108 animals realized $380,000. Of these, 10 were bought by English breeders, six of which, of the Duchess family, averaged $24,517, and one of these, the "Eighth Duchess of Geneva," was bought for Mr. Pevin Davies of Gloucestershire, at the unprecedented price of £8,120, or nearly $40,000. In 1877 Mr. Simon Beatte of Annan imported a number of short-horns from Mr. Cochrane of Canada, the proceeds of the sale amounting to £17,150 sterling, the price of 4,300 guineas being paid for one cow. But prices approximating to such figures are rare exceptions, although really fine animals of any breed will command high prices.

The short-horn breed requires probably better care and feed in order to develop its best qualities than almost any other, hence, good pasturage in summer and liberal feeding in winter are essential to this object. The blue-grass region of Kentucky is especially adapted to the highest development of this race of cattle, and the animals grown here are generally noted for their superior excellence. They are at present bred in New England, the Middle and Western States, also in Canada, where Mr. Cochrane of Hillhurst has propagated one of the choicest strains of the breed by his valuable importations and careful selections in breeding. Good care and management and liberal feeding, as we have previously stated, are essen-

tial to the highest development and success with this race, and while they will, under these circumstances, thrive well, they will not endure neglect and stinted feed without greatly deteriorating in condition. Short-horn cows that prove poor milkers will always make good beef, which cannot be said of some other breeds, and their calves are also worth more to the butcher than those of the smaller breeds that are especially valuable for dairy use.

Prof. Low, a well-known English authority, says respecting this breed:

"The multiplication in this country of a breed so greatly improved by art must be regarded as highly conducive to the improvement of this branch of rural industry. A large part of the cattle of England consists of a mixture of races having no uniformity of characters, and generally defective in some important points. The possession of a breed which can always be resorted to for crossing these mixed and defective races, is a great means of improvement, applicable to a class of animals that require it the most, causing the larger cattle of the country to approach a better model and assume a greater degree of uniformity. Further, the extension of the pure breed, and the multiplication of its numbers, are conducive in a high degree to its own permanence and improvement. When but few cultivators of it were to be found, the system of breeding from animals of the same family, and from the nearest affinities of blood, could scarcely be avoided by those who wished to preserve their stock from deterioration; but now so many fine animals are reared of the same race that no one is laid under the necessity of breeding solely from a few individuals; and in the future cultivation of the breed, hardiness, soundness of constitution, and the milking properties of the females may all receive their due share of attention. The external form has been already brought to all the perfection which art seems capable of communicating, and now those other properties remain to be attended to, without which no further refinement of breeding will avail for the purposes of profit to individuals and benefit to the country."

Absolute perfection in breeding is perhaps an impossibility, but could we combine the fine milking qualities possessed by the Jerseys with the size, symmetry, beauty, aptness to fatten and other fine beef qualities of the short-horn, the breeder of such an animal might well feel that he had attained a standard in his art, which might properly be called a creative art,—beyond which his ambition or imagination for improvement could scarcely extend.

Description of Short-horns.—One of the best descriptions we have seen of this breed is that given by Allen in his "American Cattle;" and without attempting to improve upon it, as we indorse it in all respects, we quote it as follows: To begin with the head; "the muzzle should be fine and yellowish, or drab in color, not smoky or black; the face slightly dishing, or concave; the eye full and bright; the forehead broad; the horns showing no black except at the tips, and standing wide at the base, short, oval-shaped, spreading gracefully out, and then curving in with a downward inclination, or turning upward with a still further spread (as either form is taken without prejudice to purity of blood in the animal), of a waxy color, and sometimes darker at the tips; the throat clean, without dewlap; the ear sizable, thin, and quickly moving; the neck full, setting well into the shoulders and breast, with a slight pendulous hanging of the skin, (not a dewlap,) just at the brisket; the shoulders nearly straight, and wide at the tops; the shoulder-points, or neck-vein, wide and full; the brisket broad, low, and projecting well forward, sometimes so much as almost to appear a deformity; the arm gracefully tapering to the knee, and below that a leg of fine bone, ending with a well-rounded foot; the ribs round and full, (giving free play to vigorous lungs,) and running back well towards the hips; the crops full, but as a rule scarcely equal in fullness to the Devons; the chine and back straight from the shoulders to the tail; the hips uncommonly wide, and level with the back and loin; the loin full and level; the rumps wide; the tail set on a level with the back, small and tapering; the thigh full and heavily fleshed; the twist wide; the flank low and full; the hock, or gambrel joint, standing straight (as with the horse), or nearly so; the hind leg, like the fore one, clean and sinewy, and the foot small.

The true colors of well-bred short-horns range from pure white to deep red; and between these colors, either of which frequently comprise the whole animal, their intermixtures in all variations of roan; as light roan, with the white predominating over the red; red roan, with the red prevailing over the white, as either may over the other in different degrees; red and white flecked, or spotted in every possible way. The red may also vary in shade from light, or yellow-red, into the deepest mahogany. The old-fashioned short-horns sometimes showed a drab-dun, or fawn color, mixed with white, which we have in some instances seen crop out in one of later days. We have also seen a very few instances of dark brown roan—almost smoky in shade, among those of excellent quality, and unimpeachable pedigree. But the clear white, and full red colors, either by themselves or intermixed in various beautiful and picturesque proportions, are the prevailing colors of our own time."

It thus appears that this breed differs from most others in the symmetry and rotundity of its carcass, as well as the small amount of bone and offal that it has, in proportion to the amount of flesh it is capable of producing that may be converted into good beef.

The above cut represents the head of "Aurora," a beautiful specimen of this breed formerly owned by H. G. White, of South Framingham, Mass. An American agricultural authority recently writes from England, that the great mass of British short-horns are roans, and these often light roans; next to the roans he thinks the whites would come; then red and white, with the reds last. In order to verify his opinion, he took the trouble to notice the catalogues of the Kilburn and Perth shows, and found that, of 76 bulls entered at Kilburn, 49 were roans, 14 white, 10 red and white, and 3 red; of 90 cows and heifers, 66 were roans, 11 red and white, 8 white, and 5 red. For the Perth Show 47 bulls were entered, of which 31 were roan, 9 white, 3 red and white, and 3 red; of 43 cows, 29 were roan, 6 red and white, 6 red, and 4 white. Thus of a total of 256 short-horns, thought fit for entry at the two leading fairs of the kingdom, 175 were roans, and 20 were reds.

Short-Horns for Beef.—No breed can probably be found that possesses more desirable qualities as a flesh-producing animal for the general market than the Short-Horn, and no breed has attained a popularity so great and a distribution so wide during the last century, as this. Some other breeds, such as the Devon, the Highland and Galloway cattle, it is generally conceded, produce flesh of somewhat finer grain, and more tender quality, but these are smaller and less profitable for this purpose generally than the Short-Horn, which is particularly noted for size and weight, early maturity, aptitude to fatten, and fine bone structure, thus furnishing a large proportion of meat of fine quality with a small proportion of waste. We therefore have in the Short-Horn an animal that will produce a large amount of flesh in the most desirable portions, ripen for the shambles early, easy to fatten, and that will produce the largest amount of meat with the least of fat of any breed, unless it be the Hereford, which is considered by many equal to the Short-Horn in this respect. Short-Horns will not, however, prove as profitable where grass is not abundant, as some other breeds; for while an abundance of good pasturage in the grazing season, and liberal feeding in winter are essential to the successful development of the best qualities of any breed, more especially is this true of the Short-Horn. They will not thrive on limited feed or neglect of any kind.

The objection is sometimes urged, that the rapidity with which they attain their growth and fatten prevents their meat from ripening sufficiently before appearing as beef in the market, and also that there is a disproportion of fat to the lean meat which is not found in breeds of slower growth and maturity; but we do not consider these objections sufficiently well founded to deserve much attention, and taking all things into consideration, we know of no breed better adapted to beef production for the general market, in localities suited to it, than the Short-Horn, while we know of none that will more quickly transform the native stock by crossing, than this. The Short-Horns and their grades produce some of the very finest beef to be found in the markets of the country. It is greatly superior to that furnished by the native stock, and consequently commands a much higher price. The production of such beef not only proves more profitable to the breeder and grazier, but to the purchaser and consumer, bringing as it does the quickest and most profitable returns to the breeder and grazier for the capital invested and food consumed, and the best returns to the purchaser for the market, as its fine quality causes it to be in great demand, and to command the best prices.

When well cared for with winter forage and shelter, both native stock and Short-Horn being kept in the same herd, the former at a year and a half will attain the weight of from six hundred to eight hundred pounds, while the latter will average from a thousand to twelve hundred pounds. At two and a half years the native will have reached the weight of a thousand pounds; the Short-Horn from twelve hundred to fourteen hundred pounds. At three and a half years the native may perhaps attain to the weight of twelve hundred pounds, and the Short-Horn to from fifteen hundred to two thousand pounds; the native would be still unripened and consequently not in prime condition for market, while the Short-Horn will have attained full maturity, and bring a much higher price than the native. As a market animal, the native steer is not fully matured at less than four and a half or five years, while, as previously stated, the Short-Horn steer reaches this period at least a year sooner. The latter also matures for the slaughter fully as soon as the Devon and Hereford, and a year sooner than the Galloway.

Short-Horns as Milkers.—There are properly three classes or families of Short-Horns, viz.: those which have been bred for beef production principally, those which combine the qualities of beef production with that of the production of milk, and those which have been bred more particularly with a view to milk production. While some fine milkers may be occasionally seen among the Short-Horns, the majority of breeders of this class of cattle have for some time past almost ignored, or at least greatly neglected the milking qualities in their efforts towards securing the highest possible degree of perfection for

SHORT-HORN COW, "7th DUCHESS OF HILLHURST."
Property of M. H. Cochrane, Compton, Canada.

beef; hence it has brought about the result, that while the Short-Horns were formerly known to be fine milkers, they have greatly deteriorated in this respect, and those types of the breed that furnish the best specimens for beef production are generally very inferior milkers. It now remains for the breeder to restore the milking qualities of this valuable breed, and at the same time to endeavor to do this without deteriorating their present standard in beef production, which many breeders are attempting to do. That this may be done by judicious management and careful selection in breeding is doubted by many, since the two qualities are to a certain extent antagonistic, but is believed practicable by some of our most enterprising and successful breeders. It is a well known fact that the dairies of London were formerly stocked principally with Short-Horns and Yorkshire breeds or their grades, which, after furnishing a profitable supply of milk for some time were easily and readily fattened for beef. As regards the former general excellence of this breed for the production of both milk and beef, we cite the noted English authority, Youatt, who says:

"The number of cows kept for supplying the metropolis and its environs with milk is 12,000. They are, with very few exceptions, of the Short-Horn breed—the Holderness and Yorkshire cow—and almost invariably with a cross of the improved Durham blood. The universal preference given to this breed by such a body of men, differing materially on many branches of the treatment of cattle, is perfectly satisfactory as to their value, and that on three distinct points. First, as to the quantity of milk. This we need not press, for the enemies of the Short-Horns have never contested this point. There is no cow which pays so well for what she consumes, in the quantity of milk that she returns. This, however, is not all, though it may be the principal thing which enters into the calculation of the metropolitan dairymen. * * The proprietor of the large dairy is also a dealer in cream, to a considerable extent, among these people; he is also a great manufacturer of butter—for he must have milk enough to answer every demand, and that demand is exceedingly fluctuating; then it is necessary that the quality of the milk be good, in order that he may turn the overplus to profitable account in the form of cream and butter. The employment of the Short-Horn cow in all the dairies is convincing proof that her milk is not so poor as some have described it to be. It is the practice in most of the dairies to fatten a cow as soon as her milk becomes less than four quarts a day. They are rarely suffered to breed while in the dairyman's possession. The fact of their being so often changed is proof that while the cow gives a remunerating quantity of milk for a certain time, she is rapidly and cheaply fattened for the butcher as soon as her milk is dry. Were much time or money employed in preparing her for market, this system would not answer, and would not be so universally adopted. Fattening and milking properties can therefore combine in the same animal, and they do so here."

The very fact of this breed having been valuable milkers in the past, and that some families of it are at present, proves that the race can be brought to that standard again, when the proper means are resorted to to attain such a result.

Short-Horns as Working Oxen.—Although the pure-bred Short-Horns are used for farm work and draft in some sections, yet their size, weight, aptitude to fatten, and slow movements are objections to their general recommendation for this purpose, in those sections where ox teams are employed; and for these reasons they are not as desirable for this use, as the more active Herefords and Devons, or crosses with these or the native stock, either of which make excellent workers.

DEVONS.

THESE beautiful cattle date back to great antiquity; in fact, there is no well established breed in this country or England that dates back so far. It is claimed by some writers that they were known in England at the time of the Roman invasion. Be this as it may, their origin is involved in obscurity, and the blood of no other known breed can be traced in them. They are of beautiful form and color, admirably adapted to hilly countries and scant pasturage, as well as combining the three distinctive qualities of milk-production, beef, and labor. The chief objection to them seems to be in their small size. In the latter respect different families vary considerably. Those of the southern part of the county from which the breed derives its name are large in size, and their bones and muscles of coarser texture than those of the northern portion, while their aptitude to fatten is less, although they possess superior milking qualities.

The portion of this country in which this breed is most numerous, is perhaps New England and some of the middle States, although it is quite extensively disseminated in some of the Western and Southern States. In a special article written expressly for this work, Hon. J. Buckingham of Ohio says:

"In all his points the Devon is the finest formed and most blood-like of cattle. He is to his congeners what the Arabian is to other horses.

Goodale defines the difference between a race and breed as follows: Races are varieties moulded to their peculiar type by natural causes, with no interference of man, and no intermixture of other varieties; that have continued substantially the same for a period beyond which the memory and knowledge of man does not reach. Such are the North Devon Cattle.

By breeds are understood such varieties as were originally produced by a cross or mixture, and subsequently established by selecting for breeding purposes only the best specimens and rejecting all others. In process of time deviations become less frequent, and greater uniformity was secured, and this is in proportion to the time which elapses, and the skill employed.

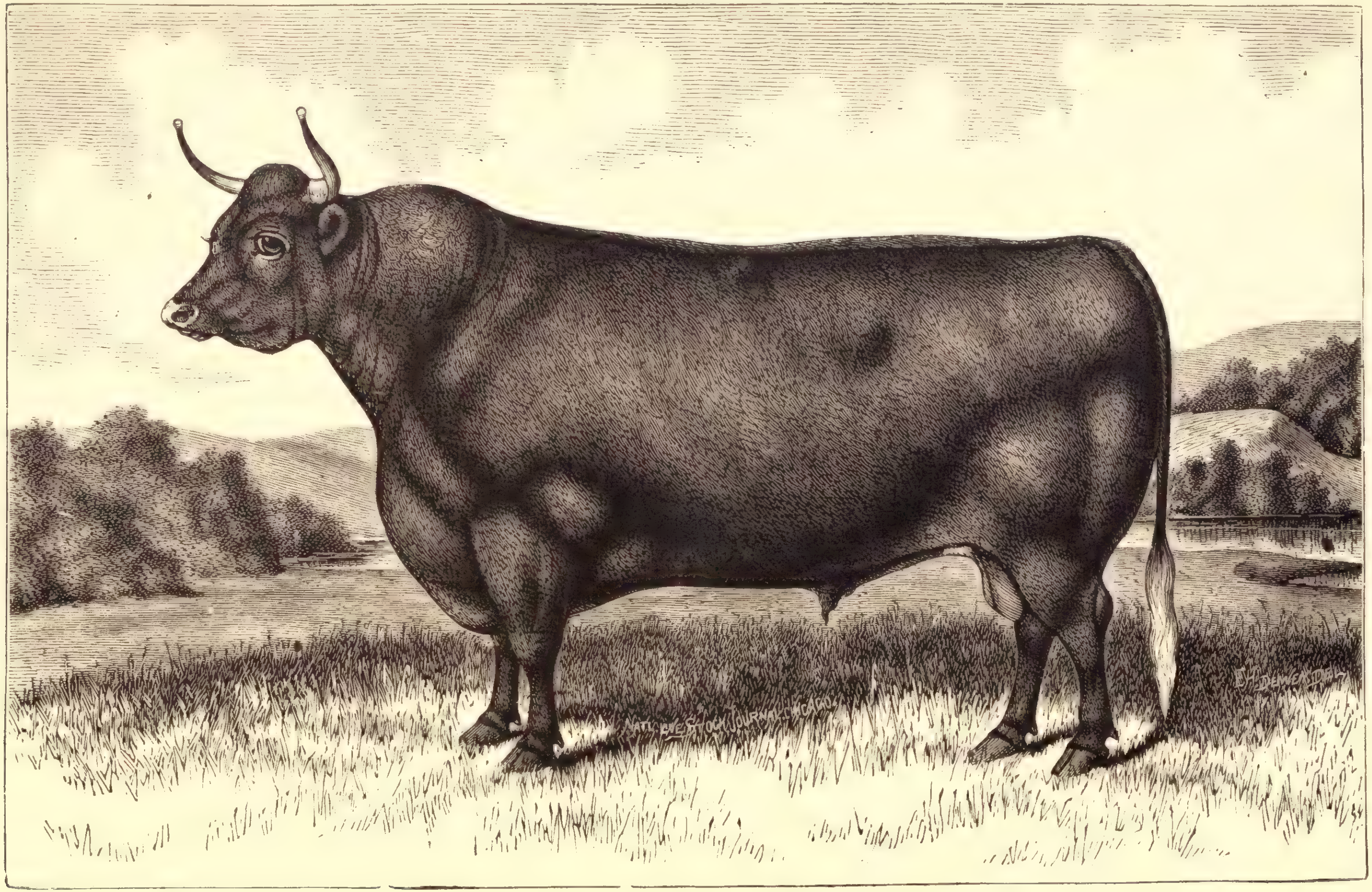
Writers on cattle divide them into three varieties; the Short-Horn, originally found in northern and eastern counties of England; the Middle-Horns in the western and southern parts, and the Long-Horned in the midland counties, and in Ireland; all agreeing that the 'Middle-Horned,' of which the Devons form one variety, are descendants of the aboriginal breed of Great Britain.

The North Devons (commonly called Devons) are a race of cattle indigenous to the county in England from whence they take their name, where from time immemorial they have reigned alone, admired for their beautiful red coats, elegant form, good disposition, active gait, and also for their strong vitality, as is shown in their power of reproducing their own form, color, and general characteristics in their progeny or their grades. The country and climate had much to do in the muscular development and constitutional vigor, which are so naturally fixed and perfected that crossing with any other breed would be more likely to injure them than improve them.

Originating centuries ago, when the wild grasses afforded them scant feed, it necessitated continued exercise in hunting for and gathering their subsistence.

By such natural exercise continued through many generations, the muscles of the breed have been developed and rendered compact, and their bones solidified, till each bears a due proportion to the other, and both to the size of the body in all its parts, producing a form of the most beautiful symmetry.

The bulls, on an average, weigh from 1,600 to 1,800 pounds, though when transferred



NORTH DEVON BULL, "SHELTO, 2d."
Property of Gen. L. F. Ross, Avon, Ill.

to our rich valleys of blue-grass pastures and corn, not unfrequently reach 2,000 to 2,200 pounds."

Description.—The color of the Devon is of a deep red, great pains having been taken by breeders of the improved families of this breed with respect to this point, in the selection for breeding purposes, those having any tendency to materially deviate from this color being rejected. This characteristic has been fairly established, and their color, as well as other strong points, is stamped with absolute certainty on their offspring. To such an extent is this true, that when the Devon bull is crossed with the native and grade cows of whatever color, the progeny will, with very rare exceptions, be red like the sire, while there is no race of cattle in which any admixture of other blood may be so easily traced.

The head is finely formed, and well set, being lean, rather short, broad between the eyes, and a face somewhat dishing, tapering to a fine flesh-color or slightly yellow muzzle. The horns are of medium length, or perhaps might be called rather long, cream-colored, black at the tips, upright, and curving outward. The eye is bright, full, mild in expression, rather large, and is surrounded by a yellow-tinted ring. The skin is thin and yellow, hair of medium length, soft and silky, neck rather long, with veins full and smooth, little or no dewlap, shoulders somewhat slanting, chest wide and full, back straight and broad, ribs round and well expanded. The flanks are full and deep, and the hips rather wide, and level with the back. The legs are small, flat, and sinewy; tail full at the setting, and tapering towards the end, usually terminating with a bunch of white hair. The size of the Devon is somewhat small, when compared with our native stock. Oxen, however, when full grown, will range in live weight from thirteen hundred to sixteen hundred pounds; bulls from a thousand to thirteen hundred, and cows from eight hundred to a thousand pounds.

Our illustrations of this breed are faithful and life-like representations, being made from photographs of the living animals (as indeed all our plates of animals are), and not only this, but of the best type of each species and breed to be found in the country.

Devons in the Dairy.—The Devons were formerly more celebrated as milkers than at present, the improved race being regarded as medium in this respect. The quality of their milk, is however, rich, and superior to that of many of the heavier milking breeds.

Their milking qualities have in a measure deteriorated through efforts towards improvement in other respects, but that they have been used with profit in the dairy, will be seen by the following records of yield which have been obtained from various authentic sources. Mr. C. S. Wainwright of Rhinebeck, N. Y., made fourteen pounds of butter per week from Helena; F. P. Holcomb of New Castle, Del., nineteen and one-half pounds a week from Lady; Hon. H. Capron, formerly of Robin's Nest, Ill., twenty-one pounds in nine days from Flora 2d. C. P. Holcomb, New Castle, Del., in twelve weeks, made from one cow 174¾ pounds of butter, or an average of fourteen pounds nine ounces per week; during one week she made nineteen pounds, and in three days nine and one-half pounds; W. L. Cowles, Farmington, Conn., sixteen and one-half pounds in ten days; J. Buckingham, Duncan's Falls, Ohio, in three months, from four cows, an average of forty-four and one-half pounds per week, besides using the cream and milk in a family of seven persons; L. G. Collins, Newark, Mo., from the dam of Red Jacket, sixteen and three-fourth pounds per week; Mr. Coleman, twenty-one pounds per week for several weeks in succession; Mr. Hurlbut of Connecticut, from Beauty, averaged sixteen pounds per week during the month of June, when she was sixteen years old; E. H. Hyde, Stafford, Conn., from Gem, 215¼ pounds of butter in ninety-five days, an average of over two and one-fourth pounds per day.

It is generally supposed that the rotundity of form and compactness of frame which contribute so much to the remarkable beauty of the North Devon cow—a peculiarity of form which disposes an animal to take on fat readily—is incompatible with good milking qualities,

and Youatt in this connection expresses the opinion that "for the dairy the North Devon must be acknowledged to be inferior to several other breeds. The milk is good, and yields more than the average proportion of cream and butter; but it is deficient in quantity." He also maintains that the milking qualities could not be improved without probable or certain detriment to the grazing qualities.

The editor of this work some years since had occasion to examine several animals from the celebrated Patterson herd, which would have been regarded as remarkable milkers, even among good milking stock. They had not, to be sure, the beautiful symmetry of form and fineness of bone which characterize most of the modern and highly improved pure-bred North Devons, and had evidently been bred for many years with special reference to the development of the milking qualities, great care having been used to select both sires and dams from the best milking stock, rather than that of the finest forms. The Devon has been bred principally for beef and labor, rather than for dairy use, and its chief merit lies in this direction.

Devons as Working Oxen.—As a working ox, this breed may perhaps very justly be said to excel all others in beauty, intelligence, activity, docility, strength according to size, and the ease with which animals may be matched. They are very fast walkers on the road, and are ambitious workers, while they possess great endurance. Care should be used, however, not to overload them, or test their strength too severely, as they are of small size. They are, however, suited to all the ordinary labor of the farm, and are more hardy than some of the large breeds. Mr. Buckingham, to whom previous reference has been made, says oi this race of cattle in this connection: The Devon ox grows much larger than the bull or cow; he has a long, large, symmetrical frame, with a clear, sharp-looking head, prominent eyes, flesh-colored nose, and handsome upturned horns, which are quite fine at the point. Shoulders quite oblique and well placed, his ribs well sprung from a straight back; hind quarters full and heavily muscled; his fore-arm thick and strong, but small below the knee, with good solid hoofs. I have seen two yoke of Devon cattle, weighing 3,600 and 4,000 pounds to the yoke, trot off with an empty wagon for two and one-half miles without walking a step, and then haul back 5,000 pounds of coal. The same oxen hauled 4,500 pounds of potatoes ten miles to the city, and back empty every day in the week, making the trip as quick as a good pair of horses with only 2,500 pounds of a load. At any time they can be soon fattened for the shambles, and the price of their meat at Smithfield, England, testifies to the quality of the same.

In the rocky farming districts of the New England States, Devon oxen are almost a necessity. At all events, no intelligent farmer in New England who has rocky soil to till, and once possessing them, will ever consent to be without them afterwards; for on rough lands and hilly roads they are as good as the horse, without being as expensive to keep. Besides when *well kept*—and oxen should always be well kept—if accident befall them, they can be turned over to the butcher with little, if any loss; whereas the horse under similar circumstances would be a total loss.

As a draught ox, the Devon does not equal the Hereford, because less in size and weight; but in proportion to size and weight, no ox of any breed whatever can either out-draw or outwork him.

Devons for Beef.—There seems to be a fineness of flesh and a delicacy of flavor in the Devon beef not excelled by that of any other breed, except it be the Highland breed of Scotland, which usually brings a little higher price in the London markets than any others; while in this country the Devons are generally first selected from the herds by butchers, where they can be found, being regarded as more choice and marketable than any other breed. The beef from this breed, in fact, possesses all the fine qualities combined, being fine-grained,

HEREFORD BULL, "SUCCESS."
Property of T. L. Miller, Beecher, Ill.

tender, juicy, fine flavored, and nicely marbled, or rather the lean and fat are well intermixed. It fattens readily, and matures in about the same time as the Short-Horn.

Though small in size, it is claimed by many breeders with whom they are especial favorites, that for the food consumed, they return as large a proportion of beef as the larger breeds. We think, however, that the offal or waste from several small cattle must be somewhat greater than that of the same live weight of larger breeds. They mature nearly as soon as the Short-Horns, and fatten readily. Dr. E. H. Woodward of Wisconsin says of them: "The progress and improvement of the Devons has continued steadily onward, not only retaining all the estimable qualities for which the early herds are noted, but are to-day exhibiting proportions that astonish even the breeders of Short-Horns.

"Banister" (734) weighed at six months old 630 pounds. "Barefoot" (732) bred by the Hon. James Buckingham, Zanesville, Ohio, weighed at two years old 1,428 pounds. Betty 2d, bred by I. S. Newton, Esq., of Verona, Dane county, Wisconsin, 2,000 pounds at four years old.

The Devons do not mature quite as early as the Short-Horns, but are much more remarkable for longevity, it being not an uncommon occurrence for a cow to retain her breeding and milking qualities until over twenty years old."

Mr. William Mattoon, of Springfield, Mass., slaughtered a bull named "Springfield," several years since, the dressed weight of which was 1,179 pounds after hanging sixty hours; and also a cow whose live weight in full feed was 1,215 pounds, the dressed weight of which was 911 pounds, the shrinkage being less than twenty-five per cent. Another bull of this breed, owned by the same party, the "Duke of Hampden," when sixteen months old weighed 1,210 pounds, having gained in the seventy-five days previous 210 pounds, equivalent to two and four-fifths pounds per day. The feed given him was one quart of meal per day. When this animal was three years old, he weighed 2,030 pounds. His herd of cows, varying from four to seventeen years, weighed on an average in the autumn, 1,233$\frac{3}{4}$ pounds each.

From the London Smithfield market reports, we glean the following facts. The Earl of Leicester's steers, on his Holkham estates, gave dead net weight, of 1,000, 1,200, and 1,400 pounds. Those of the Duke of Norfolk, in Suffolk, were from 900 to 1,000 pounds each. One is reputed to have given dead net weight of 1,593 pounds at five years and eleven months. Another that was three years and seven months old gave dead net weight of 1,316 pounds (rough tallow 160 pounds). For many localities they are better adapted than some of the heavier breeds, especially so in hilly sections and mountain ranges where grass may be short, and the pasturage scanty.

HEREFORDS.

THE Hereford cattle derive their name from a county in the western part of England. Their first importation to the United States was made in 1816 or 1817, by Henry Clay of Kentucky, who was a great admirer and patron of fine stock. They have not, however, been imported to this country in large numbers until a comparatively recent date, although they are a valuable breed of ancient origin, and have received considerable attention in England during the last century. Herefords have not been as widely disseminated in England as the improved Short-Horns, they being found principally in some of the western counties of England, and the adjoining ones in Wales.

At present they seem to be rivals of the Short-Horns in this country, where they are acquiring increased popularity for beef, and as working oxen. Like the Short-Horns, they

are admirable grazier's cattle, and are best adapted to regions where there is a great abundance of the best pasturage, being a heavy breed, although they will thrive on coarser and less food than the Short-Horns, and are also considered by many as more hardy than the latter. When well fattened, they make most excellent beef, their bodies being compact, level, and massive, while they take on flesh very rapidly.

Professor Lowe says of them: "They have the orange-yellow color of the skin which distinguishes the *Pembrokes* and the *Devons*, and that medium length of horns which separate these breeds and their varieties from the race termed Long-horned. It cannot be supposed that they have been kept free from intermixture with the Long-horned and other varieties of the lower country, but they may be referred to that group of breeds which comprehends the *Pembroke*, the *Devon*, the *Sussex*, and the *Glamorgan*, and which some writers have proposed to term Middle-horned, a designation which distinguishes them from the Long-horned on the one hand, and the Short-horned on the other.

But whatever the character of the former cattle of Herefordshire, the breed as it now exists owes all of its reputation to modern changes. About the year 1766 the late Mr. Benjamin Tomkins began a system of breeding which ultimately exercised a great influence on the stock of this part of England. It appears that size, and adaptation to the dairy and the purpose of labor, were then the properties chiefly sought for by the breeders of Herefordshire. Mr. Tomkins, when a young man, was in the employ of an individual, afterwards his father-in-law, and had the especial charge of the dairy. Two cows had been brought to this dairy, supposed to have been purchased at the fair at Kington, on the confines of Wales. Tomkins remarked the extraordinary tendency of these animals to become fat. On his marriage he acquired these two cows, and commenced breeding from them on his own account. The one with more of white he called Pigeon, and the other, of a rich red color with a spotted face, he called Mottle; and it is remarkable that the marking of the two cows may be distinguished in their descendants at the present day. Mr. Tomkins appears to have selected good cows where he could obtain them in the district, but to have reared his bulls from his own stock, although, in the earlier stage of his improvements, he sometimes made use of other bulls when they suited his purpose. After a time, however, he abandoned the practice, and confined himself in breeding to his own stock. It thus appears that the principle of his system was selection of the most suitable individuals for breeding, and that having produced, by this means, animals of the properties required, he confined himself to his own herd. Having arrived at the improvement sought for, he communicated to the individuals, by intermixture with one another, that uniformity and permanence of character which constitute a breed."

This valuable breed of cattle are at present more numerous in the Western and Middle States — especially the former — than in the Eastern or Southern, but their great merit causes them to be highly prized wherever they have been introduced.

Description. — The Herefords of a century ago were described as a deep red, or brown in color, with mottled faces. Some of the best specimens of the breed were mottled or roan throughout. The improved Hereford of to-day has a white face,—sometimes, though rarely, slightly mottled,—white throat and belly, while the white usually extends from the top of the head back on the neck, and occasionally, though not commonly, continuing along the back. The remaining part of the body, except, perhaps, a portion of the legs, is generally of a dark red color, although sometimes a light red. The ears are usually red, the forehead broad; eyes bright and mild in expression, horns slender and spreading, head of medium size, though larger and not quite as clean as that of the Devon; chest deep; hips well developed and level with the back; hind quarters long and well rounded; buttock on a level with the back; hair soft and fine; body round and full, and well formed; in fact, their general form resembles that of the Devon so closely that a definite description seems unnecessary.

TWO-YEAR-OLD HEREFORD HEIFER.
Property of T. L. Miller, Beecher, Ill.

Mr. Rowlandson states in the Journal of the Royal Agricultural Society of England, that the Herefords were originally brown, or a reddish-brown, and relates an incident of the first appearance of a white-faced calf of this breed in the herd of a Mr. Huntington, near Hereford. This occurred about the year 1750. The keeper of the herd came to the house of the owner one day, bearing the remarkable intelligence that the favorite cow had a white-faced bull calf. Here was something that had never been known to have occurred before, and the calf became quite a curiosity. It was agreed that the animal should be reared and used as a propagator of the breed, which was accordingly done, and the progeny became peculiarly celebrated for white faces. This probably is the origin of this characteristic of the present breed of Herefords. Aside from color and size, — they being about a fourth larger than the Devon, — their general characteristics are very similar to the latter breed. As beef producers they mature early, and are sufficiently grown for fattening at from three to four years.

Value of Herefords for the Dairy. — The Hereford has little merit as a dairy breed, having been bred principally with a view towards developing, as far as practicable, the fattening qualities for which they have been justly celebrated. The former general practice in their native country was to permit the calves to run with the dams from four to six months; the bull calves often eight months. Under such circumstances, it could not be expected that the milking qualities of the breed would be largely developed. With the enlightened views of breeders of the present day exemplified in practice, there is no doubt but that Herefords might in a few generations become great milk producers. In such a case, however, the breed would probably lose to a certain extent some of the fine beef points, on the same principle that the Short-Horn has gained them by a general breeding out of the milking characteristics.

That some really good milkers have been found among Hereford cows will be seen by the following, taken from the dairy records of this breed. A cow owned by a Mr. Cook in one of the Western States, is reported as making fourteen pounds of butter per week, while a Mr. Lengmore possessed one that gave twenty-two quarts of milk per day, the quantity yielding two and a half pounds of butter. A four-year old heifer is mentioned in another report as producing eight pounds of butter per week. When the Herefords are bred with special reference to dairy qualities as a general practice, there will doubtless be a great change in them in this respect.

Beef Qualities of Herefords. — In this capacity the Hereford is a superior animal. The beef is of fine texture, delicate flavor, well marbled or mixed, and commands a high price in the markets. These animals mature for the butcher's block at from three to four years, fatten readily, and will put on more meat and fat for the food consumed than almost any other breed, being considered by some to be superior to the Short-Horn in this respect, while their carcasses, when fully matured and fattened, are large, compact, and level. It is now comparatively but a few years since the movement was made in the West to bring forward the claims of this breed of cattle for the production of beef, and thus far it has proved very successful. They are at present competing with the Short-Horn in this country, as well as in Europe, for the palm of excellence.

The production of beef upon the plains of the Great West is no longer an experiment, but has become a leading industry, commanding the capital of the wealthy men of this country and England as well. Formerly the steers that came to our market from this source were few in number, and very inferior in quality. They were the Texan cattle, somewhat improved by a change to the better grazing region of that section. Since that period, great improvement has been effected by the infusion of new blood, crosses having been produced by the Short-Horn and other pure breeds, while the Hereford has also been tested sufficiently to prove its great value in improving these cattle. A few years since a small number of Herefords were taken to Colorado, and proved themselves admirably adapted for this pur-

pose, reproducing their like in quality and character, and enduring the change of climate and conditions most successfully. It is claimed by the advocates of this breed, that when grazing and feeding with mixed herds of cattle, the grade Herefords make larger gains than any other breed or grade of steers. It is also claimed by some, that the cross produced by the Hereford bull and Short-Horn cow will give a produce that will command a better price in the beef market than the pure Short-Horn. In point of beauty, their color might be considered an objection, a white or mottled-faced animal never being so pleasing to the eye as a uniform color; still, there are other points of merit in beef production superior to color, and when looking at the question in a practical point of view, it must be conceded that this breed justly merits a place among the first in beef production.

The illustrations of Herefords which we insert are faithful copies of some of the best types of the breed they represent, — as in fact all of the animal cuts in this work are, — and indicate their characteristics better and more completely than could be described in words.

Herefords as Oxen.—The Hereford ox is an excellent working animal, being large, strong, muscular, and well developed, docile, and easily matched. He is, however, less active than the Devon, owing to superior size and weight; is free, willing, and intelligent, as well as kindly in disposition.

Good oxen are also produced by crossing the Hereford Bull with the native cow, the progeny almost invariably possessing the strong characteristics of the sire, especially in form and color. When no longer useful as oxen, they can in a short time be very readily converted into first-class beef for the market.

POLLED OR HORNLESS CATTLE.

THERE are several varieties of polled or hornless breeds of cattle in England, the principal of which are the Angus or Aberdeen, Galloway, and the Suffolk. According to Low, in his "Cattle of the British Islands," the Angus breed originated more than a century ago, in the north of Scotland, and are now considerably scattered throughout the grazing region of Great Britain. They have been greatly improved, by careful breeding, within the last quarter of a century, and with the Galloways are highly esteemed as beef cattle in the English markets, the meat furnished by them being of excellent quality, while their carcasses have proportionately a small amount of waste. The Galloways derive their name from the county in which they originated, and have within a few years past been imported into this country and bred to a limited extent, being frequently seen at fairs. They are hardy animals, good feeders, admirably adapted to hilly districts, and are more properly classed with the beef than dairy breeds, being noted more especially for the production of a superior quality of beef, than for fine milking qualities. These cattle are valuable in producing a cross with other breeds. The grade produced in crossing them with the Short-Horn Bull has been found to combine in a great degree the good qualities of both parents. Wherever the milking qualities of the Angus breed have received due attention in breeding, the result has been very satisfactory in this direction, as will be seen by the following from the North British Agriculturist, written by the Earl of Airlie—and the same will doubtless prove true with respect to the Galloways:

"I have at present seventeen pure Polled Angus milch cows in my dairy. The greatest number of these give from twelve to fourteen, and sometimes sixteen Scotch pints for a considerable time after calving. The milk is admitted to be much richer than that of either the Short-Horn or the Ayrshire. As regards the length of time for which they will continue to

give milk, my cow Belle of Airlie (1,959), dam of Belus (749), as pure a Polled animal as any in the herd book, used to be milked all the year round. Last year, when I was from home, they left off milking her about a month before she calved, and she died of milk fever, induced, as I believe, by the circumstance that she had not been relieved of her superabundant milk. The cow Miss M'Pherson (1,252) of the Erica tribe, which I purchased recently of Mr. Adamson, is now giving six Scotch pints a day, more than nine and a half months after calving. The dairy cows referred to were selected by me with a view to their milking qualities; and whenever I found the produce turn out bad milkers, I drafted and fed them for the butcher, except in a few instances, when, from their shapes and blood, I thought them likely to produce a valuable tribe of cattle."

The Suffolk breed, known also as the Suffolk Dun and Norfolk, are descended from the Galloways, but differ from them very materially. They were formerly celebrated for their large production of milk, and at present combine the two qualities of milk and beef production, although in the latter respect they are regarded as not quite equal to the other polled or hornless breeds.

JAMESTOWN BULL "ST. PATRICK."
Weight 1,600 lbs. Owned by A. W. Cheever, "Pine Hedge" Farm, Sheldonville, Mass.

The dun color was the prevailing one with this breed a half-century or more ago, but is now rarely seen, being rejected as an almost sure indication of inferior qualities. They are mostly now of a reddish brown, or deep red, and are less heavy in the neck and shoulders than the Galloways. They are very hardy, docile, and good feeders.

Mr. A. W. Cheever, editor of the "New England Farmer," and breeder of a family of polled cattle known as the "Jamestowns," of which we give an illustration, says of them :

"These polled cattle bear the local name of "Jamestowns," and are so highly esteemed in the vicinity, that the Norfolk Agricultural Society has authorized committees to award

prizes to them as a distinct breed, although they are hardly yet entitled to the name of pure-breds, as they have frequently been crossed with the Jersey and Ayrshire stock. The origin of the "Jamestowns," as near I can learn, is as follows: In 1847, Captain R. B. Forbes went to Ireland as commander of the U. S. ship Jamestown, with a cargo of provisions for the people who were suffering from the famine due to the failure of the potato crop. On his return the Lord Lieutenant of Ireland, wishing to confer a favor upon the commander, made him a present of a "Suffolk" heifer, which proved to be a remarkably deep milker, giving in her flow twenty-six quarts, beer measure, of the richest milk. Captain Forbes sold the heifer to John Marland, of Andover, Mass., giving the proceeds to the Irish charity fund, and she was afterwards owned by John D. Bates, of Swampscott, and by a Mr. Osborne, of Danvers. She had few heifer calves, and one owned by Wallace Thaxter, of Boston, proved a superior dairy cow. Several of her bull calves were raised, and left their impress upon the dairy stock in the vicinity of Boston. In 1854 this cow dropped a bull calf which was secured by the late Dr. Eben Wight, of Dedham, and named "Jamestown" after the noble ship that brought his mother to this country. He proved himself as remarkable in his progeny as that of his kind on his mother's side. His sire was "Beverly," a thoroughbred Jersey, out of "Flora," by the "First Prize Bull" at the Royal Agricultural Show in Jersey. "Flora" was imported by Mr. Thomas Motley, and proved a leading representative of that popular dairy stock, having made sixteen pounds of butter per week.

The "Jamestowns" are noted for their gentleness. When the bull "Jamestown" was five years old, a boy of the same age could manage him with safety. The animals are very hardy, are hearty feeders, and hold out in their milk, often through the entire year. My own herd has been bred with more regard for quality than quantity of milk, and for several years past has averaged 200 to 250 pounds of butter per cow. In extra favorable seasons, the quantity has exceeded the above amount. As dairy cows, I presume the "Jamestowns" may be excelled by the best families of pure Jerseys, but their large size, their ease of fattening when dry, together with their excellent dispositions, make them the most desirable dairy animals, in my estimation, that I have ever met. I can put my whole herd into a yard so small that they can hardly turn around, and yet feel perfectly free from anxiety or fear of injury to the animals. The bull I am now keeping, though past three years old, has never worn a ring, is tied in the stall with cows, and is as easily and safely handled as a six week's calf."

Description of Galloways.—The Galloway is a very compact, well proportioned animal, as will be seen by the following description of the breed by Youatt:—

"The Galloway cattle are straight and broad in the back, and nearly level from the head to the rump. They are round in the ribs, and also between the shoulders and the ribs, and the ribs and the loins. They are broad in the loin, without any large projecting hook bones. In roundness of barrel, and fullness of ribs, they will compare with any breed, and also in the proportion which the loins bear to the hook bones, or protuberances of the ribs. The Rev. Mr. Smith, the author of the Survey of Galloway, says that, 'when viewed from above, the whole body appears beautifully rounded, like the longitudinal section of a roller.' They are long in the quarters and ribs, and deep in the chest, but not broad in the twist. The slightest inspection will show that there is less space between the hook or hip bones and the ribs, than in most other breeds, a consideration of much importance, for the advantage of length of carcass consists in the animal being well ribbed home, or as little as possible lost in the flank.

They are short in the leg, and moderately fine in the shank bones,—the happy medium seems to be preserved in the leg, which secures hardihood and a disposition to fatten. With the same cleanness and shortness of shank, there is no breed so large and muscular above

GROUP OF IMPORTED POLLED ANGUS COWS.
Property of Burleigh & Bodwell, Lang Farm, Vassalboro', Me.
[Copied by permission from *Rural New Yorker.*]

the knee, while there is more room for the deep, broad, and capacious chest. He is clean, not fine and slender, but well proportioned in the neck and chaps; a thin and delicate neck would not correspond with the broad shoulders, deep chest, and close, compact form of the breed. The neck of the Galloway bull is thick, almost to a fault. The head is rather heavy; the eyes are not prominent, and the ears are large, rough, and full of long hairs on the inside.

The Galloway is covered with a loose, mellow skin of medium thickness, and which is clothed with long, soft, silky hair. The skin is thinner than that of the Leicestershire, but not as fine as the hide of the improved Durham breed, yet it handles soft and kindly. Even on the moorland farms, where the cattle during the greater part of the year are fed on the scantiest fare, it is remarkable how little their hides indicate the privations they endure. The prevailing and fashionable color is black,—a few are of a dark brindled brown, and still fewer are speckled with white spots, and some of them are of a dun or drab color, perhaps acquired from a cross with the Suffolk breed of cattle. Dark colors are uniformly preferred, from the belief that they indicate hardiness of constitution." Another eminent authority, Mr. Culley, says of them: "In most respects, except wanting horns, these cattle resemble the Long-Horns, both in color and shape, only they are shorter in their form, which probably makes them weigh less. Their hides seem to be a medium between the Long and Short-Horns, not so thick as the former, nor so thin as the latter, and like the best feeding kind of Short-Horns, they lay their fat upon the most valuable parts, and their beef is well marbled or mixed with fat. They are mostly bred upon the moors or hilly country of Galloway, until rising four or five years old, when they are taken to the fairs in Norfolk and Suffolk, previous to the turnip feeding season, whence the greater part of them are removed in the winter and spring (when fat) to supply the consumption of the capital, where they are readily sold, and at high prices, for few or no cattle sell so high in Smithfield market, owing to their laying their fat in the most valuable parts, and it is no unusual thing to see one of these little bullocks outsell a coarse Lincolnshire bullock, although the latter is heavier by several stones."

A century ago the Galloways frequently had small horns, but they are now characterized as entirely hornless, except rarely one may be found hanging loose on the skin, with no development of bone from the skull to attract them to the latter.

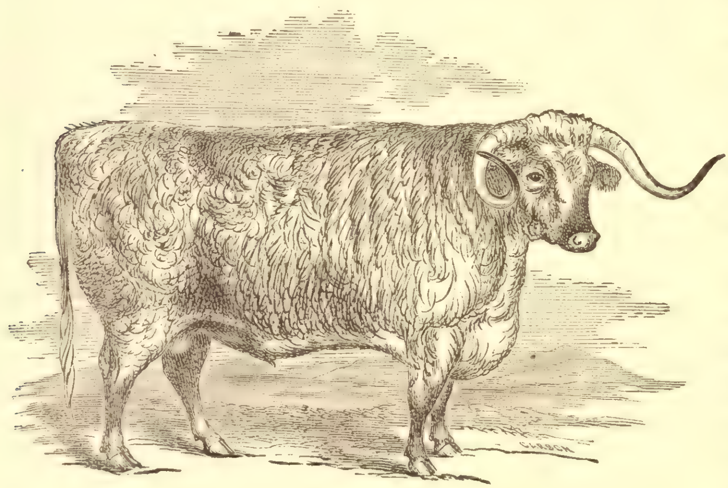
LONG-HORNS.

THESE cattle formerly had some influence on American stock, but have not been bred to any extent as a distinct breed in this country; neither could the improved Long-Horn be recommended to compete with the popular breeds that have been imported, and are at present used to improve our native stock, although they are not without some valuable characteristics. When compared with superior breeds they cannot in any sense be regarded as rivals, and the application of the natural law of "the survival of the fittest" would condemn them to extinction as a race.

This breed had its origin in Great Britain, but from what direct source is unknown. Youatt says of them: "In the district of Craven, a fertile corner of the West Riding of Yorkshire, bordering on Lancashire, and separated from Westmoreland chiefly by the western moorlands, there has been, from the earliest records of British Agriculture, a peculiar breed of cattle. They were distinguished from the home-breds of other counties by a disproportionate and frequently unbecoming length of horn. In the old breed, this horn frequently projected nearly horizontal on either side, but as the cattle were improved, the

horn assumed other directions; it hung down so that the animal could scarcely graze, or it curved so as to threaten to meet before the muzzle, and so also to prevent the beast from grazing; or immediately under the jaw, and so to lock the lower jaw; or the points presented themselves against the bones of the nose and face, threatening to perforate them.

In proportion as the breed became improved, the horns lengthened, and they are characteristically distinguished by the name of 'The Long-Horns.' Cattle of similar description were found in the districts of Lancashire, bordering on Craven, and also in the Southeastern parts of Westmoreland; but *tradition*, in both of these districts, pointed to Craven as the original habitation of the Long-Horn breed. If there gradually arose any difference between them, it was that the Craven beasts were the broadest in the chine, the shortest, the handsomest, and the quickest feeders; the Lancashire ones were larger, longer in the quarters, but with a fall behind the shoulders, and not so level on the chine. Whence these cattle were derived, is still a disputed point."



LONG-HORN OX.

They were formerly a coarse, loose-jointed animal, characterized by great length of horns, thick, firm skin, long, compact hair, coarse, leathery thickness of the neck, and large hoofs. The improved Long-Horn, as previously stated, is an animal possessing some very good points, and is still used in the dairy in portions of England, although not to any great extent.

HIGHLAND CATTLE.

THIS breed of cattle are widely scattered over the Highlands of Scotland, but are said to be found in the greatest perfection in the larger Hebrides. A prominent English writer says of them, "Well bred oxen of this breed, when of mature growth, and in good condition, exhibit a symmetry of form and noble bearing unequalled by any cattle in the kingdom. Although somewhat slow in arriving at maturity, they are contented with the coarsest fare, and ultimately get fat where the daintier Short-Horns could barely exist. Their hardy constitution, thick, mellow hide and shaggy coat, peculiarly adapt them for a cold, humid climate and coarse pasture. The milk of the cow is very rich, but as they yield it in small quantities, and soon get dry, they are unsuited for the dairy, and are kept solely for the purpose of suckling each her own calf.

Of these cattle, those of a dun or tawny color are often selected for grazing on the parks of the aristocracy, where they look quite as picturesque as the deer with which they

are associated, resembling, as they do, the so-called wild cattle that are carefully preserved in the parks of the nobility, and like them are probably the descendants of the cattle of the ancient Britons."

Description.—The true Kyloe or West Highland cattle are described as follows, by an extensive breeder of them,—Mr. Malcolm McNeill, of the Isle of Irlay, one of the Southern Hebrides :

"The Highland bull should be black, the head not large, the ears thin, the muzzle fine, and rather turned up. He should be broad in the face, the eyes prominent, and the countenance calm and placid. The horns should taper finely to a point; and, neither drooping too much, nor rising too high, should be of a waxy color, and widely set on at the root. The neck should be fine, particularly where it joins the head, and rising with a gentle curve from the shoulder. The breast (*brisket*) wide, and projecting well before the legs. The shoulder broad at the top, and the chine so full as to leave little hollow behind them (that is, the *crops* are *full*). The girth behind the shoulder deep; the back straight, wide, and flat; the ribs broad, the space between them and the hips small; the belly not sinking low in the middle; yet, in the whole, not forming the round and barrel-like carcass which some have described. The thigh tapering to the hock-joint; the bones larger in proportion to the size than in the breeds of the southern districts. The tail set on a level with the back. The legs short and straight. The whole carcass covered with a thick, long coat of hair, and plenty of hair also about the face and horns, and the hair not curly."

These cattle are principally valuable for the production of a fine quality of beef. In fact their beef is regarded in the English market as superior to all others, being tender, juicy, nicely marbled, and of delicate flavor. They are small animals, but fatten readily. The weight of a carcass of the bullock will range from 600 to 800 pounds.

These animals are not found in this country, but we do not doubt that they would prove profitable in certain sections, such as mountain districts, where the pasturage is scanty and coarse, and where the more delicate and heavier breeds could scarcely be maintained.

Dairy Breeds.—Although nearly all breeds of cattle are used to a certain extent in the dairy, there are some that are much better adapted to the purpose than others, and are bred with special reference to it. The breeds that are the most highly prized for quantity and richness of milk production are generally characterized by less flesh and fat, and are also of smaller size than those commonly designated graziers' cattle, or the beef breeds; although there are some exceptions, such as the Highland cattle, for instance, that are of small size, and are especially noted for their fine quality of beef. It is in fact generally known, that the cow, in its natural or wild state, yields only a sufficient quantity of milk to sustain her offspring for a few weeks, and until it can derive sustenance from other food. She therefore, under such conditions, produces milk but a small portion of the year, and it is only by judicious treatment for many generations that this tendency to revert to that condition has been in a measure obviated.

By care and selection in breeding, as well as in management with reference to the development of special characteristics, some breeds have the dairy qualities more fully developed than others, and these have been transmitted from one generation to another. Different breeds, as well as individuals of the same breeds, will also be found to differ more or less from each other, with regard to the quality and quantity of milk produced. Dairy stock should therefore be selected with reference to the special purpose to which the milk produced is to be appropriated, whether it be for milk, for use as such, or for the manufacture of butter or cheese.

It will be found generally that the large milkers and larger dairy breeds are the most desirable for the cheese dairy or factory, while the smaller milkers, and smaller breeds, yielding a richer milk, will prove most profitable for the butter dairy and creamery.

The Jerseys or Alderneys, Guernseys and Swiss are justly celebrated for the production of butter, while the Ayrshire, Dutch Friezian or Holstein breeds,—especially the latter,—are noted for large yields of milk, and are admirably adapted for use in the cheese dairy. Other breeds such as the Devons, Short-Horns, etc., often furnish cows of exceptionally fine dairy characteristics, while individuals among the native stock will not unfrequently be found, that will give astonishingly large yields of rich milk. The pure breeds are however more reliable, and can be depended upon with greater certainty in transmitting their good qualities than grades, but when the farmer does not feel able to procure the pure breeds, he should grade up, using the best of his native or common stock as the basis.

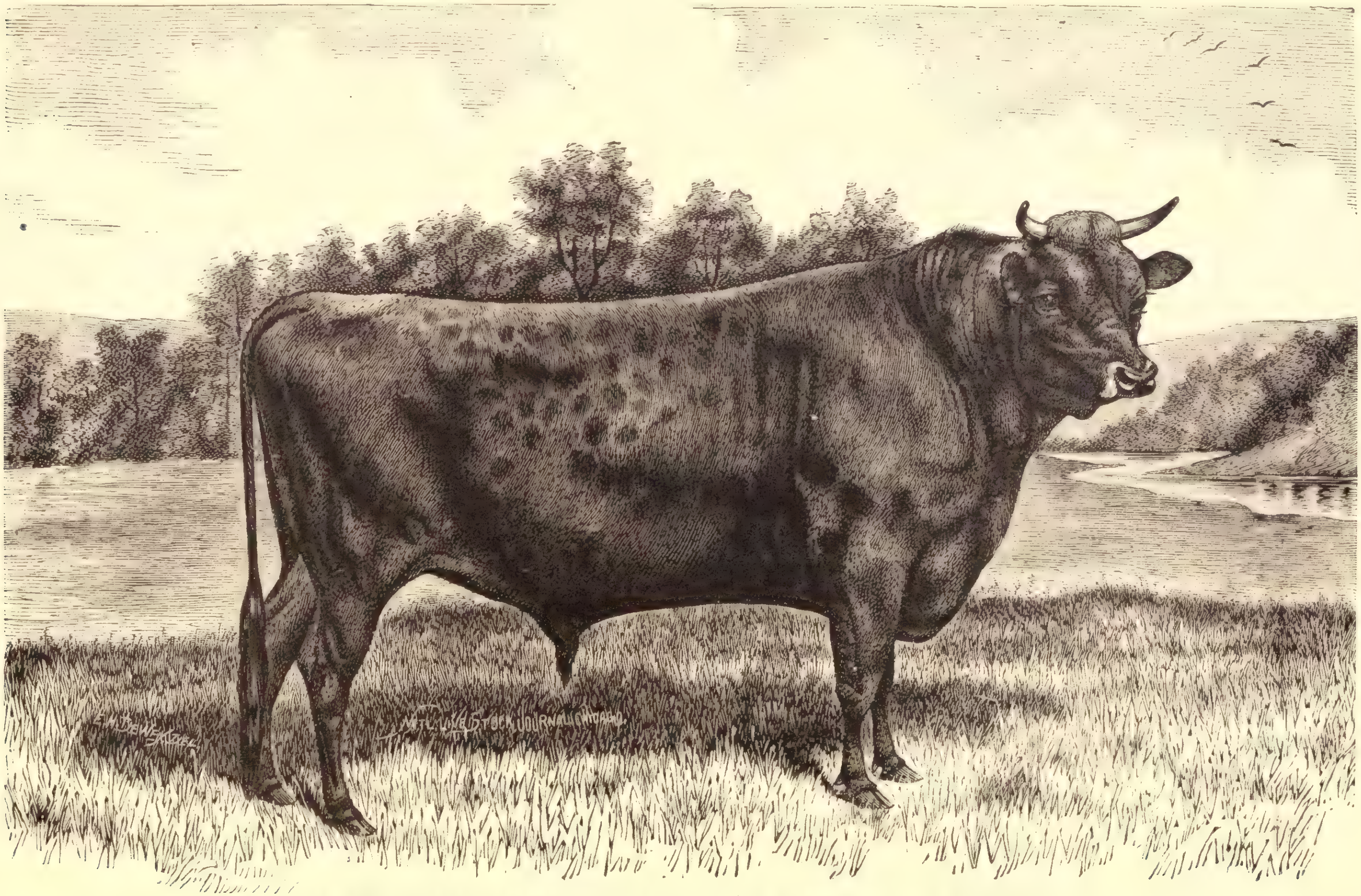
Classes of Dairy Cows.—It will be seen by what has been said with reference to dairy breeds, that this stock may be divided into three classes, or distinct branches, viz.: cows that are best adapted to the butter dairy or creamery, where the manufacture of butter of the best quality is the principal object; cows that are adapted to the manufacture of cheese or the production of large quantities of milk, and those that are especially adapted for family use. For the first, a cow that produces milk of a very rich quality should be selected; milk in which the butter particles readily separate from the water and rise in the form of thick, yellow cream on the surface. Here quality is of the first importance in the milk, and quantity secondary. The milk of some cows possesses more than twice the amount of butter element than others, while the color of the cream and butter will vary in a corresponding degree. As a butter dairy, or creamery cow, we have good examples in the Jersey, or Guernsey breed.

For the cheese or milk dairy, the object is generally to secure the largest quantity of milk, with less reference to the quality than in the former class. Consequently the cows best adapted for those whose business it is to supply milk to families in large quantities at ordinary rates, the cheese factory, or for the manufacture of cheese in the farm dairy, are the large milkers, of which the Dutch and Ayrshires furnish good examples. These breeds also furnish butter of very good quality, and in large quantity, but are not characterized as being as remarkable in this respect as the Jersey or Alderney, Guernsey and Swiss breeds.

For family use, if rich milk and cream for the table is desired, and a docile animal that loves to be petted by members of the household is wanted, we know of none better adapted to the purpose than the Jersey or Guernsey cow. If a larger quantity of milk is required, irrespective of quality, then some of the larger milk-yielding breeds will admirably subserve the purpose.

JERSEYS.

THE Channel Islands have long been celebrated for cattle of superior value in the production of milk rich in butter properties, it being of extraordinary quality, and yielding a greater proportion of cream and butter than can be obtained from that of any other breed. These islands, as is well known, are four in number, Alderney, Jersey, Guernsey, and Sark, lying near the coast of France, and have been described as resembling "bits of France that have drifted out to sea." The breeds of cattle of these several islands are similar, although the Guernsey differs more from the common type, and resembles in many respects the Normandy races, while the Alderney closely resembles certain of the Norway breeds. The largest of this Channel Island group is Jersey, it being about twelve miles in length and five in breadth. From here the largest numbers of these cattle have been thus far imported to the United States; hence, this breed are now more generally known in this country by the name of "Jersey," although in Britain they are commonly called "Alderney."



IMPORTED JERSEY BULL, "LE BROCQ'S PRIZE."
Property of Churchman & Jackson, "Beach Grove Farm," Indianapolis, Ind.

These cattle were imported into this country more than fifty years ago, but not in considerable numbers until during the last twenty-five years, during which time they have grown rapidly in popular favor, and have now become quite common in all the New England States, New York, New Jersey, Pennsylvania, and Maryland, and a few other states farther south and west. It is stated that in 1789, the Jersey breed was considered so much superior to any other breed then known, that an act was passed by the local legislature prohibiting the importation of any foreign breed into the island, under a penalty of two hundred livres, to which was also added the forfeiture of the boat and its tackle, and a fine of fifty livres upon every sailor on board who failed to give information of such cattle being landed. The animals landed were also doomed to immediate slaughter and their flesh given to the poor, and to the present time no foreign cattle are permitted to be landed on the island, except as butcher's meat. By such means the purity of the Jersey blood has been maintained. They are natives of a milder climate than our Northern States, and are therefore not quite as hardy as some of our other breeds, and will not thrive under neglect. They should always be provided (as indeed all cattle should,) with a plenty of good food, and also with warm shelter in cold or stormy weather, and they will abundantly repay all the care bestowed upon them. They are pre-eminently a dairy breed, being too small to be profitable for beef, while their size and consequent want of strength renders them ill-adapted for working oxen, although Low states that in their native country the bullocks are used for labor.

In England, as in this country, aside from dairy use, Jerseys are much in demand by gentlemen of means residing in the neighborhood of cities, for the purpose of furnishing rich milk and cream for their tables. In such cases they are permitted to graze their lawns, and are carefully tended and petted.

Description of Jerseys.— With respect to the general appearance and characteristics of the Jersey or Alderney breed, Low says: "The cattle of this race are small and ill-formed when regarded as animals to fatten. The neck of the cow thin; her shoulder light; her chest narrow; her belly large. The limbs are slender; the pelvic bones are prominent; the lumbar region is deep; the croup short and drooping, and udder large. The muzzle is narrow; the horns are short, slender, and curving inwards. The color is usually of a light red or fawn, mixed with white; but frequently individuals are black, mixed white, or dun, and sometimes cream-colored. The skin is thin, and of a rich, orange-yellow, and the fat is tinged with the same color. The animals are gentle, and somewhat delicate in constitution. Being small, the milk they yield is likewise small in quantity — although fully in proportion to their bulk of body — and it is viscid and rich in cream. In their native country, the bullocks are used for labor, to which they are better adapted than, from the slender form of the dam, might be inferred."

Mr. L. F. Allen describes the breed more definitely, as follows: "Beginning with the head — the most characteristic feature — the muzzle is fine; the nose either dark-brown or black, and occasionally a yellowish shade, with a peculiar mealy, light-colored hair, running up the face into a smoky hue, when it gradually takes the general color of the body; the face is slightly dishing, clean of flesh, mild and gentle in expression; the eye clear and full, and encircled with a distinct ring of the color of the nose; the forehead bold; the horn short, curving inward, and waxy in color, with black tips; the ear sizable, thin, and quick in movement. The whole head is original, and blood-like in appearance, — more so than in almost any other of the cattle race, — reminding one strongly of the head of our American elk. The neck is somewhat depressed — would be called ewe-necked by some — but clean in the throat, with moderate or little dewlap; the shoulders are wide and somewhat ragged, with prominent points, running down to a delicate arm, and slender legs beneath; the fore-quarters stand rather close together, with a thinnish, yet well-developed brisket between; the ribs are flat, yet giving sufficient play for good lungs; the back depressed and somewhat hollow; the belly

deep and large; the hips tolerably wide; the rump and tail high; the loin and quarter medium in length; the thigh thin and deep; the twist wide, to accommodate a clean, good-sized udder; the flanks medium; the hocks or gambrel joints crooked; the hind legs small; the udder capacious, square, set well forward, and coverd with soft, silky hair; the teats fine, standing well apart, and nicely tapering; the milk veins prominent.

On the whole, she is a homely, blood-like, gentle, useful little housekeeping body, with a most kindly temper, loving to be petted, and like the pony with the children, readily becomes a great favorite with those who have her about them, either in pasture, paddock, stable, or the lawn. The colors are usually light-red or fawn, occasionally smoky-gray, and sometimes black, mixed or splashed more or less with white. Roan colors, and a more rounded form, are now and then seen among them, but we do not like them (as they savor of a Short-Horn cross, which they should not have), as anything but their own blood and figure, and that of the ancient stock, deteriorates them — as Alderneys."

An extensive breeder of Jerseys in Massachusetts says with respect to size and color in this breed: "We prefer the Jersey cow of medium size, large as may be *without coarseness.* Symmetry and uniform shape and color are always strong and valuable points in families and strains of Jersey cattle, indicative of good breeding.

The color of Jerseys is a mere matter of fancy — having no influence with their dairy qualifications. Breeders have their fancy for light fawns with white, solid fawns, light and dark, black and light tongues, etc. We are not wedded to any color, although we admit that it often has a marked influence on the prices of Jerseys.

Having bred sixty-seven animals, the progeny and descendants of one cow, and having solid and partly-colored animals in nearly equal number, raised and kept under like conditions, we can discern no difference in their milk product, which would be in the slightest degree influenced by color."

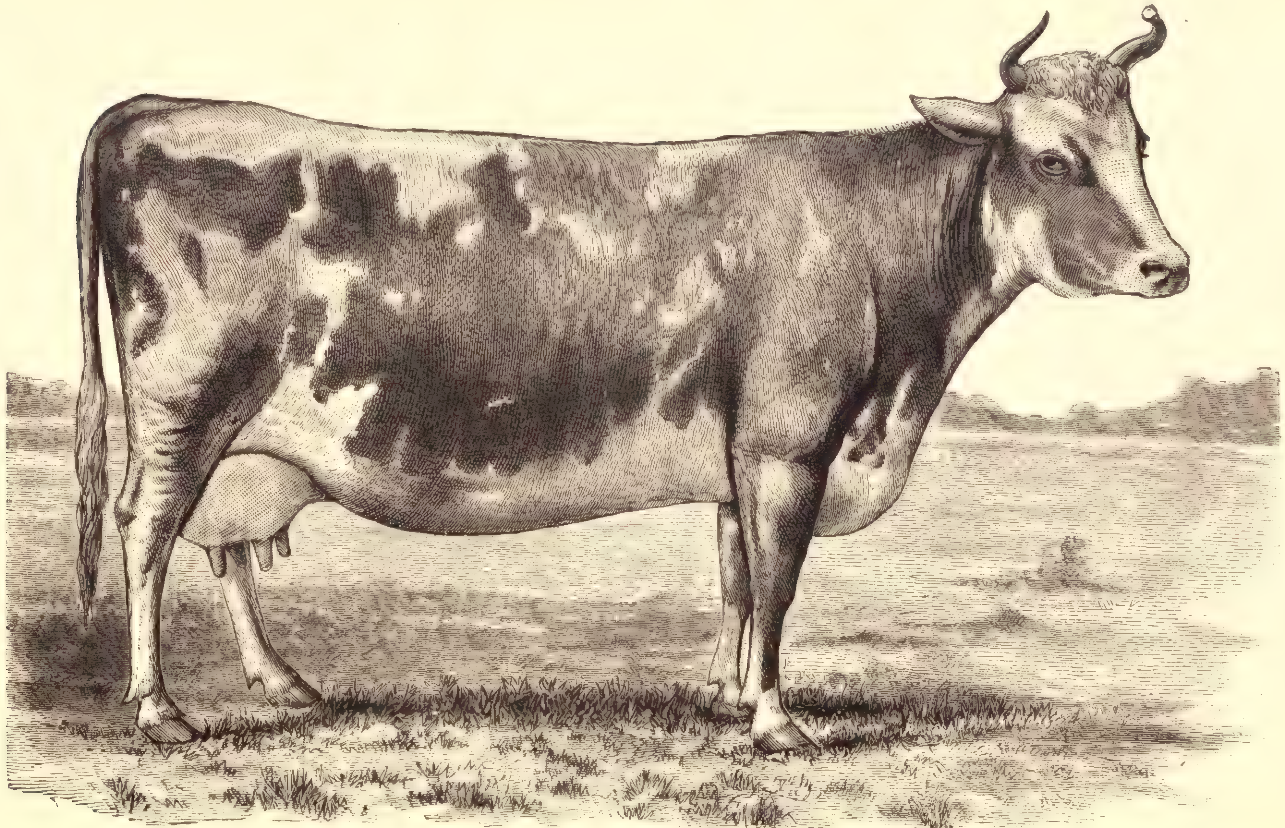
The first importations were only about one-half the size of the native cattle, and did not gain the favor of the farmers of that day, but as their real merits have become known they have been better appreciated, and at present they are generally acknowledged to be worthy the first rank as butter-dairy animals. They have also become gradually better adapted to our climate,—Americanized as it were,—and the Jersey cattle of to-day are in many respects of different type from their ancestors at the time of the first importation of this breed to our country. Their size now approaches nearer to that of the native cattle, while they have become more hardy, owing to the different conditions to which they have been subjected, climatic changes, different food, and the manner of obtaining it, etc., all of which have had a tendency to produce physical changes which may be regarded as an improvement without deteriorating their value as milk producers.

Scale of Points for Jersey Cows. — The following scale of points adopted by the American Jersey Cattle Club will be found of interest and value to breeders and purchasers of this stock generally, as well as those of other dairy breeds, since it gives prominence to those points from which dairy profit is to be derived, and places secondary the breeding for beauty and symmetry of form, although the latter is not entirely overlooked:

SCALE OF POINTS FOR JERSEY COWS.

Adopted by the American Jersey Cattle Club.

POINTS.		COUNTS.
1.	Head small, lean, and rather long,	2
2.	Face dished, broad between the eyes and narrow between the horns,	1
3.	Muzzle dark, and encircled by a light color,	1
4.	Eyes full and placid,	1
5.	Horns small, crumpled, and amber color,	3
6.	Ears small and thin,	1



"JERSEY QUEEN OF BARNET."

Property of A. B. Darling, New York City. Formerly owned by J. S. Kenerson, Barnet, Vt.

This cow produced from May 20, 1881, to May 20, 1882, 12,854 lbs. 6 oz. of milk, from which 851 lbs. 1 oz. of butter were made.

7.	Neck straight, thin, rather long, with clean throat and not heavy at the shoulders,	4
8.	Shoulders sloping and lean; withers thin; breast neither deficient nor beefy,	3
9.	Back level to the setting on of tail, and broad across the loin,	4
10.	Barrel hooped, broad and deep at the flank,	8
11.	Hips wide apart and fine in the bone; rump long and broad,	4
12.	Thighs long, thin, and wide apart; with legs standing square, and not to cross in walking,	4
13.	Legs short, small below the knees, with small hoofs,	3
14.	Tail fine, reaching the hocks, with good switch,	3
15.	Hide thin and mellow, with fine, soft hair,	4
16.	Color of hide when the hair is white, on udder and inside of ears, yellow,	5
17.	Fore udder full in form, and running well forward,	8
18.	Hind udder full in form, and well up behind,	8
19.	Under udder free from long hair, and not fleshy,	5
20.	Teats rather large, wide apart, and squarely placed,	6
21.	Milk veins prominent,	5
22.	Escutcheon high and broad, and full on thighs,	8
23.	Disposition quiet and good-natured,	3
24.	General appearance, rather bony than fleshy,	6
	Perfection,	100

In judging heifers, omit Nos. 17, 18, and 21.

The same Scale of Points shall be used in judging bulls, omitting Nos. 17, 18, 19, and 21, and making due allowance for masculinity.

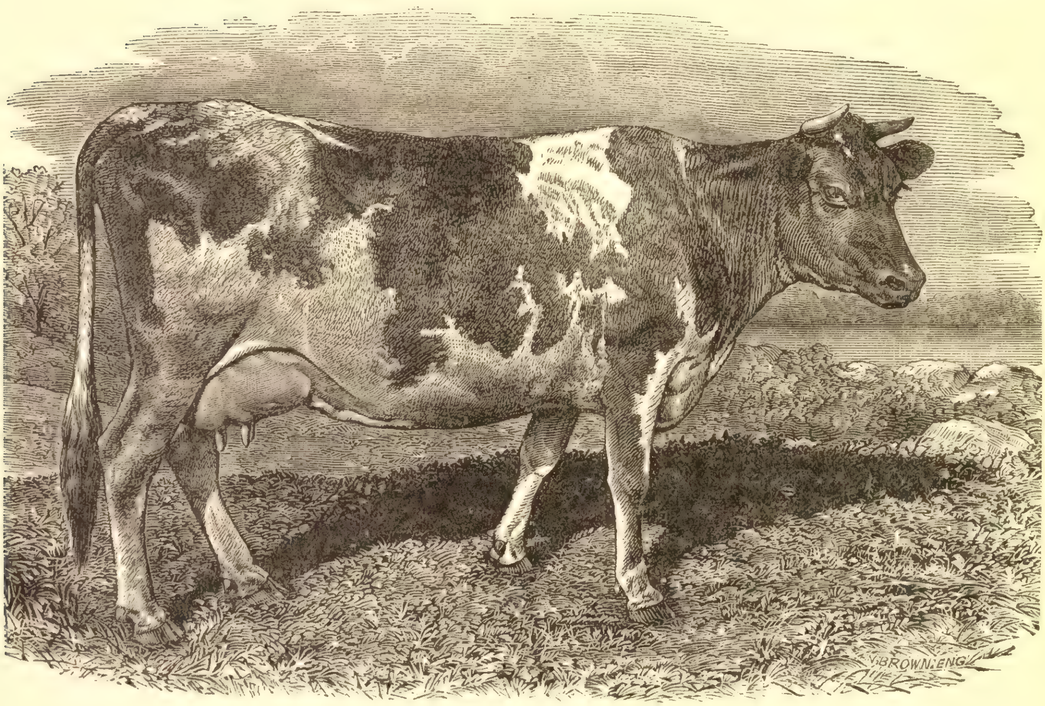
It is also recommended in the same connection that judges at fairs do not award prizes to animals falling below the following *minimum* standard, viz.: cows, 70 counts; heifers, 55 counts; bulls, 50 counts.

Testing Jersey Cows.—The milk of the Jersey cow is extremely rich, and of a yellow color, furnishing a remarkably large proportion of cream and butter. So superior is their milk in quality, that even two or three good cows of this breed will materially change the quality of the cream and butter in a herd of eighteen or twenty cows. While the Jersey generally produces less milk in quantity than some of the larger breeds, yet its exceeding richness more than makes up for the difference in this respect. But with reference to the latter, it must be remembered that the size of the animal should be taken into account, and that in proportion to its size, and quantity of food consumed, the Jersey also gives a fair quantity of milk.

In order to show what has been accomplished with this breed in the production of milk and butter, we give a few statements, some of which have been furnished especially for this work at our request. It is to be regretted that in such tests, the statement has not in all cases been furnished respecting the amount and kind of food given during the time in which the milk and butter records were made, as the amount and quality of food would of course materially affect the secretion of milk. But since the object of giving the result of the tests is not to determine the respective merits of individuals of this breed, but rather to show its value in the production of milk rich in butter qualities, the records are sufficiently definite for the latter purpose.

Jersey Queen of Barnet.—The following milk and butter record of this noted animal, as furnished us by her present owner, Mr. A. B. Darling, of New York, is for one year, beginning May 20, 1881, and ending May 20, 1882, the amount of milk produced during that time being 12,854 lbs., 6 oz., and of butter the enormous quantity of 851 lbs., 1 oz.

		Milk.		Butter.	
		lbs.	oz.	lbs.	oz.
1881.	May 20, to June 1,	485		20	7½
"	June,	1396	1	80	6½
"	July,	1401		84	5
"	August,	1278	12	76	½
"	September,	1116		72	2
"	October,	1148	8	73	4
"	November,	1090		74	11
"	December,	1057	1	74	1½
1882.	January,	975	12	75	
"	February,	684	12	55	3
"	March,	864		66	11
"	April,	846	4	61	4
"	May 1 to May 20,	511	4	37	9
	Total,	12,854	6	851	1



BELLE OF SCITUATE.

Formerly owned by Mr. Charles O. Ellms, of Scituate, Mass.

Belle of Scituate, etc.—Mr. Ellms, the former owner of this noted cow, gives the following history of her:

"About twelve years ago I had some twenty-two head of Jerseys, all of which made light-colored butter in winter. While at church, my mother met a lady, who, in conversation at noontime, in speaking of butter-making, said that one of their cows had made eleven pounds of as yellow butter as she had ever seen. This was in February. I requested my brother, who lived near, to secure me a calf from that cow, as I was anxious to make yellow butter in winter. My brother spoke to them as the calving time approached, and they got the consent of the owner. The cow dropped a heifer, which we brought up and named

Jersey Belle of Scituate. As the time approached for her first calf, one of our selectmen was in the barn one day, and, looking at her, exclaimed, 'Have you ever examined this heifer? She is all swollen under her belly, clear to her shoulder, with an enormous bag!'

At the time of dropping her calf, we had another cow in milk, and mixed it with that of the heifer. From the two we made 604 pounds of butter that year. We often remarked that the heifer must be a great butter animal. The next year we kept her milk separate, and found out her butter quality. When six years old her udder measured five feet one inch around. In after years it was larger, measuring on the level five feet three inches. Her escutcheon was eighteen inches in width.

On March 5th, 1877, she made three pounds six ounces of butter, and in the week following, twenty-one pounds five ounces, and for the year ending March 5th, 1878, 705 pounds of butter. Her greatest weekly yield the following year was twenty-two pounds thirteen ounces. In the year 1880 she made her greatest weekly record. Her calf was dropped June 7th, and from the 15th to the 21st of June inclusive, seven days, she made twenty-five pounds three ounces of butter. She was giving forty-five pounds of milk daily at the commencement of the test, and forty-four pounds a day at the close of the week. The butter from the first four days (one churning) was fourteen pounds eight ounces, and the next three days ten pounds eleven ounces.

In the color of her butter she was as remarkable as in yield. In winter, as in summer, it was of the same golden hue, so rich that the best judges found great difficulty in believing it was not artificially colored, until they saw the cream."

Another writer mentions the "Howard" cow, seven years old,—a cross by a Jersey bull and Short-Horn cow,—and says: "The test began April 1, 1878, when the cow ran with the herd in a field, and had but moderate feed. During the month she gave 1360 pounds of milk. May 1st she was put in good pasture, and was soon giving 52 to 54½ pounds per day. She gave 1536 pounds of milk the last seven days of the month, which made 18¾ pounds of butter, with nothing but grass for food. The cow is a roan but shows the Jersey markings about her head. Carries no flesh when in milk."

Eurotas, etc.—The Jersey cow "*Eurotas*," also has a remarkable record of butter yield, which in nine months and six days amounted to 706 lbs. and 3 oz. This cow was fed three pints of corn meal night and morning, and on very hot days was stabled during the middle portion of the day, and given a good supply of green corn fodder. Before the time of pasturage, in the spring, she was fed thin gruel twice a day, but received no dry grain. Of course, in addition, she had all the good hay she wanted to eat.

Mr. H. E. Alvord speaks of the Oaks cow, that made 513 lbs. of butter in nine months, as tested by the Massachusetts State Society, also the Scott cow, a native of Vermont, that made 504 lbs. of butter,—ranging from 16 to 19 lbs. per week for the first two months, and of a grade cow in New Jersey that made 21 lbs. in one week. He says:

"I have myself had several cows, five quarts of whose milk made a pound of butter; one of which, on repeated trials, gave a pound of butter for every gallon of milk. Less than a month ago, a friend showed me three pounds of beautiful butter, good weight, made from twelve and a half quarts of milk—the product of a cow for one day—and there was no reason to doubt the statement. Last March I lost a Jersey, in no sense a fancy or fashionable animal, from whom I repeatedly obtained over 20 lbs. of butter a week, on disconnected trials—546 lbs. in a year. She averaged in the worst 'fly time' a little over two pounds per day."

Hon. R. S. Houston, of Kenosha, Wis., who formerly for many years gave considerable attention to cheese-making, says concerning his herd of grade Jerseys:

"My herd consists of fifty cows from two to eight years old, from half to full bloods. My

stock does not show as well as it might, as I have sold almost all my young stock—all that were coming two years old. I have found the Jerseys hardy, docile, and easily kept. The following statement shows the milk and butter each month of the year. The milk was weighed as soon as drawn from the cow. It was put in the Hyde double-channel pan. The butter was weighed after working, ready for the salt. We began the season with fifty-six cows. During winter and spring we sold six. We have two families of fourteen persons to supply with milk. I have deducted twenty pounds a day for this:

	Lbs. Milk.	Lbs. Butter.	Lbs. Milk for one of Butter.
January,	18,403	899	20.4
February,	16,914	811	20.9
March,	23,321	1,006	23.1
April,	28,533	1,321	21.6
May,	36,997	1,750	21.1
June,	31,701	1,532	20.7
July,	27,246	1,286	21.2
August,	27,623	1,319	20.8
September,	26,280	1,272	20.6
October,	24,695	1,245	19.8
November,	20,356	1,029	19.7
December,	23,114	1,200	19.5
Total,	305,493	14,670	Av. 20.8

Our cows were fed from January to May on corn-meal and bran, equal parts, 10 to 12 lbs. per day; through the month of May we fed bran alone; June, July, and August, grass only; September and October we fed sowed corn; November and December, corn and oats, equal parts, with corn from the stook; to-day we feed corn-meal and bran. The herd consists of fifty cows of $\frac{1}{2}$, $\frac{3}{4}$, and full blood. Ages, five two-year-olds, eight three-year-olds, others up to eight years old.

One great reason of our better success the last part of the year over the first was in handling the milk. We use the Hyde double-channel pan. The first part of the year we used it without water under the pan. Since that time we have run water in cold as well as in warm weather, heat of room 70 deg."

On the above estimate, that 20 lbs. of milk deducted each day, as used by the two families, fully offsets the quantity given by the six cows that were sold in the early part of the year, we have fifty cows which gave the very good average yield of 293.4 lbs. of butter each month during the year. The column giving the number of pounds of milk required to produce one pound of butter, for each month of the year, is an interesting one. Excepting for March, it will be noticed that there is comparatively little variation in the quantity from month to month.

Landseer's Fancy, a Jersey cow owned by a gentleman in Columbia, Tenn., is reported by her owner as yielding 17 lbs. $2\frac{1}{2}$ oz. of butter in seven days, and 71 lbs. $2\frac{1}{2}$ ozs. in thirty-one days.

Mr. Edward Burnett, of Deerfoot Farm, Southboro', Mass., gives the following account of the yearly milk yield in quarts, of several of his Jerseys, commencing with the year 1875. Those beginning after that year did so as heifers:

	Pink 3d.	Pink 4th.	Deerfoot Maid.	Mab.	Patty.	Dolly.	Patty 2d.	Patty 3d.	Millie.	Deerfoot Girl.	Dewdrop.	Polly.
1875	7199	6757	2402	6510	......	......	......	......	......	......	......	......
1876.....	8432	8345	4947	7276	4865	......	......	......	......	......	......	......
1877.....	8228	8375	6377	6438	5677	......	......	......	......	......	......	......
1878.....	7870	6063	6371	6404	4886	4120	5041	......	......	......	......	......
1879.....	6729	4752	7723	8462	5866	5822	6629	2575	......	......	......	......
1880.....	5889	7235	8388	7134	7755	5863	5247	6349	5609	2334	5208	4811
1881.....	7121	8723	8723	7618	7559	7414	6453	4347	5661	6050	5347	6584

At a recent State fair in Iowa, the following test of Jersey cows, from the herd of Mr. Charles J. Reed, of "Meadow Brook Farm," Fairfield, was made by a committee appointed by the Board of Directors for this purpose. Being kept chiefly as a breeding herd, no attempt had been made to push the cows to a high butter yield by grain food. They were pastured during the entire season on wild grass, white clover, and blue grass, until about two weeks before the fair, when they were put upon a second growth of timothy and clover, and five days previous to shipping were fed six quarts per day of ground oats. They were then shipped 125 miles by rail. The cows tested were: Rose of Hillside (3866), and Belle of Indiana (3867); these were milked in the presence of the committee, and the milk weighed by it and delivered to Col. R. M. Littler, secretary of the National Butter and Cheese Association, appointed to conduct the test. These cows were each five months in calf, and the milk weighed thirty-five pounds. This was drawn the first twenty-four hours after their twenty-four hours' shipment. The milk was given into Col. Littler's possession at 9.12 A. M., strained into a deep can $8\frac{1}{2}$ inches in diameter and placed in a refrigerator at a temperature of 42°. As soon as the temperature of the milk was sufficiently reduced, the whole milk was churned sweet, and at 11.20 A. M. (two hours and eight minutes from the time of milking), the butter was churned, worked, and printed ready for the table.

The product was three pounds of butter, being at the rate of nine pounds per 100 pounds of milk, and $1\frac{1}{2}$ pounds per day per cow, notwithstanding their long shipment and a fast of twenty-four hours during the journey. That all the butter was not obtained from the sweet milk thus churned was shown by cream rising on the butter-milk.

The best and fairest tests are those where the animal has not been forced by excessive feeding of certain kinds of food merely for the purpose of producing a high record. The health and breeding powers of valuable animals are frequently injured by this means.

Alderneys.—The Alderney breed is so nearly allied to that of the Jersey as to require no separate description. They are generally regarded as identical, although most of the Channel Island importations to this country are from the Island of Jersey and Guernsey, there having been in reality but few animals ever brought to this country from Alderney. See JERSEYS.

GUERNSEYS.

LIKE the Jersey breed, these cattle derive their name from the island which is their original home, Guernsey being one of the Channel Islands, which are in many respects similar, and which, although belonging to England, lie near the coast of France. The cattle of these several islands are quite similar, although differing in some

respects, the Guernsey being larger in size and somewhat coarser in form than the Jersey, they having a more rounded body and less prominent bones, and seeming to partake more of the characteristics of the Normandy races of cattle. Cows of this breed have been known to weigh as high as from 1,200 to 1,300 pounds, and beef animals on the island are said to reach 2,000 pounds; these weights are, however, considerably above the average weight. These cattle are remarkably gentle and affectionate in disposition. On their native island, where they are in almost all instances tethered, their care is usually confined to the women and children, which fact probably accounts in a great measure for their extreme docility.

It is not an uncommon sight on the island to see one woman leading half a dozen cows at once from the barn to the field. These cattle are not as common in this country as the Jerseys, having until recently been imported almost exclusively to England, where they are much prized for private dairies. As they are so closely allied to the Jersey breed, of which a previous and somewhat extended description has been given, a brief space will only be required for them in this connection.

Description.—The Guernsey cow is generally from one hundred to two hundred pounds heavier than the Jersey, although lacking, to a certain extent, some of the deer-like points that the latter possesses. They are, however, equally mild and affectionate in disposition, even the bulls being very docile. The color is generally orange fawn and white, or orange red and white, although dark breeds and brindles are sometimes seen. The circle about the eyes and nose is generally lighter than the prevailing color, although not white.

The skin is soft and of an orange tinge when seen through the hair. This color is also

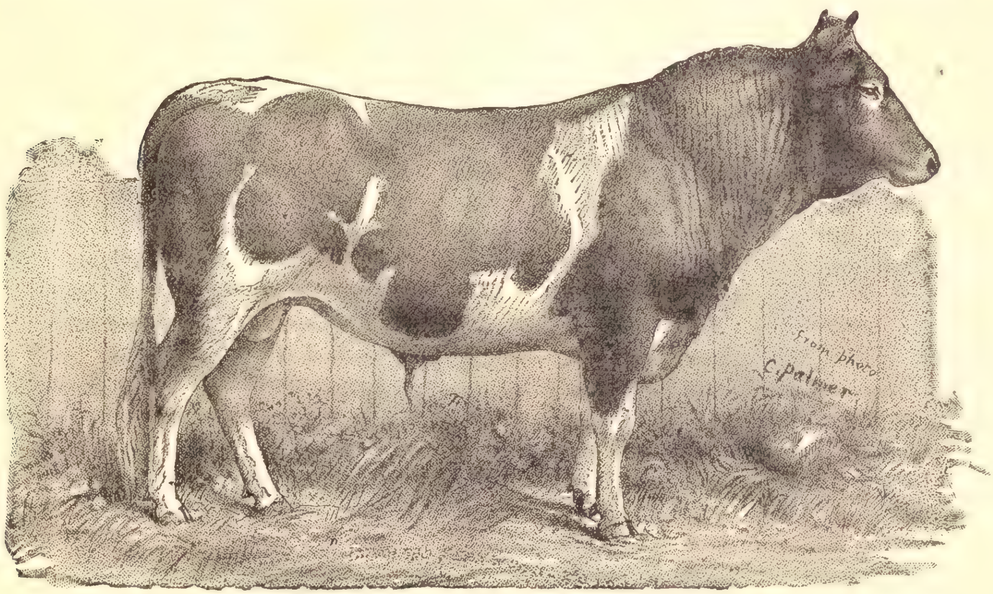
seen in the eyelids, on the inside of the ears, and about the base of the horns, which are fine in texture and waxy in feeling. The following is the scale of points adopted by the American Guernsey Cattle Club:

SCALE OF POINTS FOR GUERNSEY COWS.

	Counts.	Points.
QUALITY OF MILK.		
Skin deep yellow, in ear, on end of bone of tail, at base of horn, on udder, teats, and body generally,	20	
Skin loose, mellow, with soft, fine hair,	10	30
QUALITY AND DURATION OF FLOW.		
Escutcheon wide on thighs, high and broad,	10	
With thigh ovals,		
Milk veins long and prominent,	6	
Udder full in front,	6	
SYMMETRY.		
Back level to setting on of tail,	3	
Throat clean, with small dewlap,	1	
Legs not too long, with hocks well apart in walking,	2	
Tails long and thin,	1	
Horns curved and not coarse,	2	
Udder full and well up behind,	8	
Udder large, but not fleshy,	4	
Udder teats squarely placed,	4	
Udder teats of good size,	2	40
SIZE AND SUBSTANCE.		
Size of the breed,	5	
Not too light bone,	1	
Barrel round, and deep at flank,	4	
Hips and loins wide,	2	
Rump long and broad,	2	
Thighs and withers thin,	2	16
Head rather long and fine, with quiet and gentle expression,	3	
General appearance,	2	14
	100	100

For bulls and heifers deduct 20 counts for udder.

Dairy Characteristics.—Like her sister the Jersey, the Guernsey cow produces very rich milk which yields a large proportion of cream and butter, the latter being of the



GUERNSEY BULL.
Owned by L. W. Ledyard, Cazenovia, N. Y.

best quality, and of a deep yellow color. It is claimed by the admirers of this breed, that one good Guernsey cow in a herd of ten, will noticeably change the color and character of the butter.

The Guernsey milk makes very nice, rich cheese, yet it is most highly valued for butter production and as a luxury for the table. Although little or no grain is generally fed on

the island, the principal food of these cows being the grasses that the moist climate affords nearly the entire year, the records of butter production there, give an average of one pound per day for the whole year, while the choicest cows have been known to double that amount. In several experiments made in this country, a pound of butter has been made from between seven and eight quarts of milk, and it is stated by good authority that in the Farmington (Connecticut) creamery, the milk of twenty Guernsey cows colored the butter from 500 cows. This breed readily transmits its valuable characteristics, and grades of about three-fourths blood are frequently found to fully equal the pure bred animals in milk production.

As a beef breed, the Guernsey cannot be highly recommended, beef qualities being secondary to dairy characteristics. They will, however, fatten quite well when dry, and make very good beef. A recent writer says in this connection:

" There are cows that will fatten well when dry, and the Guernsey will be found among them, but it is so secondary a consideration that it is not entitled to the weight usually given it. Few men buy a heavy stove that will consume much and heat but little from a desire to have it sell for old iron after many years, but many will carry a poor butter cow many winters and then feed her twenty-five dollars worth of mill-feed to sell her for old cow beef at thirty dollars. It is too late for this economy, when the great natural grazing plains are sending in superb beef cattle that have cost only "herding," and dairy farmers should find it out. A *good* butter cow, one that converts her food into not only a large amount of butter, but into high-priced golden butter, should pay every year her *full beef value over and above* the product of the average " universal cow," and a good milch cow, such as a Holstein, should equally exceed the common cow in her profitable performance."

AYRSHIRES.

THIS breed originated in the county of Ayr, in the southwestern part of Scotland, and has long been celebrated in Great Britain and this country for its excellent milking qualities. Its origin is supposed to be due mainly to the crossing of the English Short-Horn bull with the common Kyloe cow of Scotland, the progeny being improved with reference to their milking qualities, until this characteristic became established and transmissible. Other breeds were doubtless used in improving these cattle, thus Rawlin says, in writing of the Ayrshire:—" They have another breed called the Dunlop cow, which are allowed to be the best race for yielding milk in Great Britain or Ireland, not only for large quantities, but also for richness in quality. It is said to be a mixture by bulls brought from the Island of Alderney with their own, or the old race of cows." Martin also states, " At some period or other, there has evidently been a cross with the Durham or Holderness, and perhaps also with the Alderney breed." Professor Low, in his illustrations of British quadrupeds, says: " From the evidence of which, in the absence of authentic documents, the case admits, the dairy breed of Ayrshire cows owes the characteristics which distinguish it from the older race, to a mixture of the blood of the races of the continent, and of the dairy breed of Alderney."

Careful selection in breeding, and the better system of management that was generally adopted soon after the early attempts towards improvement, doubtless had great influence in changing the general character of the stock of that region, as would be the case with any breed. The original stock which forms the basis of the Ayrshire breed are described by Aiton as of diminutive size, ill-fed, ill-formed, and yielding but a scanty supply of milk. They were mostly black in color, with large stripes of white along the chine and ridge of the back,

AYRSHIRE BULL, "HONEST JOHN."
Owned by William Birnie, Springfield, Mass.

and about the flanks. They had also frequently more or less white about the face. They had high, crooked horns with deep ringlets at the root, thick hides adhering to their bones, and few of them yielded more than six or eight quarts of milk a day when doing their best, or weighed when fat more than from twelve to sixteen or twenty stones avoirdupois.

He subsequently says: "It was impossible that these cattle, fed as they then were, could be of great weight, well-shaped, or yield much milk. Their only food in winter and spring was oat-straw, and what they could pick up in the fields, to which they were turned out almost every day, with a mash of weak corn and chaff daily, for a few days after calving; and their pasture in summer was of the very worst quality, and eaten so bare that the cattle were half starved, and had the aspect of starvelings. A wonderful change has since been made in the condition, aspect, and qualities of the Ayrshire dairy stock. They are not now the meagre, unshapely animals they were forty years ago, but have completely changed into something as different from what they were then, as any two breeds in the island can be from each other. They are almost double the size, and yield about four times the quantity of milk that the Ayrshire then yielded. They were not of any specific breed, nor uniformity of shape or color; neither was there any fixed standard by which they could be judged."

AYRSHIRE COW.

Property of Alex. M. Fulford, Bel Air, Maryland.

Better feeding and care, as well as judicious crossing, must have been the combined cause of the great improvement of these cattle. The Ayrshires were first introduced into the United States about the year 1822, but were imported in larger numbers about the year 1830. They were at that time usually of a dark red or brown color, flecked with white, having black noses. Those more recently imported have seemed to be more of the Short-Horn type, as far as color is concerned, the red being of a lighter shade, with more of white. They are quite hardy, and adapt themselves to the climate and conditions of this country very readily, although as a breed they do not produce as much milk in quantity as in their native

country, where the moist climate causes the pasturage to be fresher and greener than ours, and where, owing to the modifying influence of the warm waters of the Gulf Stream, a more equable temperature prevails than in this country, there being less extremes of heat and cold.

As a breed they are not as docile as some others, being naturally inclined to be irritable in disposition. For this reason they are not as desirable for working oxen, although this objection may be overcome to a certain extent by kind and gentle treatment.

Description. — In size, the Ayrshires are smaller than the Short-Horns, and although resembling them somewhat in contour, they are not as symmetrical. The breed is small, fine, and clean; the face long and narrow at the muzzle; forehead wide; eyes rather small and lively in expression; horns wide apart where they join the head, of medium length, inclining upwards, and curving slightly inward; neck long, slender, and straight, free from loose skin underneath; shoulders thin at the top; fore-quarters light in front but increasing in depth and width backwards; hind-quarters large; back short and straight, broad behind, joints rather loose and open; ribs rather flat; carcass deep; pelvis broad and hips wide apart. Tail long and slender, and set on a level with the back; udder capacious and extending well forward; teats of medium size, set wide apart; milk veins well developed; legs short with firm joints; bones fine; skin thin and elastic, covered with soft, woolly hair. In color they vary considerably, red and white, spotted or mottled being the most common, the two colors presenting a striking contrast. They are sometimes brown and white, and black and white, and occasionally, though not often, nearly or quite red; roans are also sometimes seen, also yellow and white, but less frequently than the colors previously mentioned.

Mr. Aiton says that the Ayrshire farmers prefer their dairy bulls according to the feminine aspect of the head and neck; also select for this purpose those that are not round behind, but bowed at the hock-bones and hips, and full in the flanks. The Ayrshire makes a good cross with the native or common stock of the country, and also with the Short-Horn. A high-bred Short-Horn bull and a large-sized Ayrshire cow will produce a calf which, in the opinion of good breeders, will come to maturity earlier and attain a greater weight, and consequently sell for more profit than a pure-bred Ayrshire. Such a cross will also produce more symmetry of form than is found in the latter-mentioned breed.

Dairy Characteristics, etc. — For dairy purposes, the Ayrshire cow has long been justly celebrated, her milk being rich in quality and large in quantity in proportion to her size and the amount of food consumed. In their native country the Ayrshire is bred almost exclusively for the dairy, and seldom for other objects. In this country the breed has attained great favor, especially in New England and the Middle States, where at one time it was regarded as having no superior for dairy use. To show what Ayrshires have accomplished in milk production, we will give a few items of record, obtained from various authentic sources.

The Ayrshire cow known as "Old Creamer," was in her time the champion milch cow of the world. She was owned by Hon. L. D. Hungerford, of Valley Park Farm, Adams, N. Y., and won the first prize at the New York State Fair in 1873, having yielded in three days the enormous quantity of 304 lbs. of good milk, as follows: June 11th, 102½ lbs.; June 12th, 100 lbs.; and June 13th, 101½ lbs. She gave 2,820½ lbs. of milk in the month of June, an average of over 94 lbs. per day; 2,483½ in the month of July, an average of over 80 lbs. per day; and in the month of August, 75 lbs. per day. She was at this time nine years old, and weighed 1,080 lbs. The following is the statement of Messrs. Sturtevant, of South Framingham, Mass., giving the results attained in their dairy with the Ayrshire breed.

"Ayrshire cow 'Jennie,' five years of age; last calved, August 29th. When four years old she gave, for the first week of September, 143 pounds of milk; for the first week of November, 128 pounds; total yield for the year, 5,870 pounds.

Ayrshire cow 'Tilly,' five years old. Dropped last calf April 13th. Her yield for May was 1,071 pounds (first week of May, 161 pounds); her yield for June was 1,062 pounds; for July 840 pounds (first week of July, 219 pounds); for August 724½ pounds. Under date of June 12th, I take the following record from the books: 'Tilly is fed on cut grass and one quart of oil-meal. At no time has she been fed as high as the other cows. At no time more than seven quarts of shorts, with long hay and one quart of either corn or oil-meal.' In July, no grain; in August, one quart corn-meal daily.

This is only a portion of the systematic record of the dairy. No efforts have been made for an extraordinary yield. Excellent calves. On one trial, Jersey gave 15 per cent. cream; Tilly (Ayrshire) gave 9 per cent.; average natives, 7½ per cent.

'Fannie,' seven years of age. Calved Dec. 25th. Yielded in January 1,090 pounds (first week of January, 273 pounds); in February, 874 pounds; in March, 822 pounds (first week of March, 190½ pounds); in April, 714½ pounds; in May, 683 pounds; in June, 694½ pounds; in July, 559½ pounds; in August, 450½ pounds. In June, July, and August fed on green food. During winter and spring months, consumed, on a daily average, nine quarts shorts, one quart linseed meal, and two quarts corn-meal, with corn stover and a poor quality of hay. Excellent calves. On one trial, Jersey gave 15 per cent. cream; Fanny (Ayrshire) gave 8½ per cent.; average natives, 7½ per cent."

The Waushakum herd of thirteen Ayrshires, of which a daily record of milk yield was carefully kept for eight years, showed an annual average of 2,515 quarts per cow; while a three years record of another herd of eleven cows of this breed gave an average annual milk yield of 2,587 quarts each. Low says that healthy Ayrshire cows in good pastures give from 800 to 900 gallons of milk each year. Martin makes the statement that the milk of a good cow of this breed will afford 250 pounds of butter or 500 pounds of cheese annually.

Haxton, after giving many statistics to demonstrate the value of the Ayrshire as a dairy animal, mentions one which shows that in one dairy of thirty cows the average annual yield of milk was 632 gallons each, and that nine and a quarter quarts produced a pound of butter, amounting in the aggregate to 274 lbs. in a year.

Although rich in quality, the milk of the improved Ayrshire does not, in this respect, equal that of the Jersey and Guernsey, which in many sections are gradually taking its place; still, as a dairy animal, the former must ever occupy a high place, and be classed among the superior milk breeds of the country. A cow that is of a quiet and contented disposition feeds at ease, is milked with ease, and yields more than one of an opposite temperament; while after she is past her usefulness as a milker, she will easily take on fat and make fine beef and a good quantity of tallow, because she feeds freely, and when dry, the food which went to make milk is converted into fat and flesh. But there is no kind of cow with which gentleness of treatment is so indispensable as with the Ayrshire, on account of her naturally nervous temperament. If she receives other than kind and gentle treatment, she will often resent it with angry looks and gestures, and withhold her milk; and if such treatment is long-continued, will dry up; but she willingly and easily yields it to the hand that fondles her, and all her looks and movements towards her friends are quiet and mild. For beef production the Ayrshires are of course not equal to the Short-Horn and some other breeds, having been bred solely for furnishing milk for so long a period. They however fatten quite readily, and make very good beef. They are thought by some to unite to a greater degree than any other breed the seemingly incompatible qualities of yielding a large amount of milk, and producing good beef.

DUTCH.

THE climate of Holland, together with its rich and luxuriant pasturage, so moist and succulent, would naturally tend to the production of cattle of a large growth of animal frame, and milk-yielding capacities. We therefore find that although the different races of Dutch cattle differ in some respects, there are some general characteristics in them all, prominent among which are those previously mentioned, namely, large size and the yielding of a large amount of milk. These cattle have long been bred in their native country, which is one of the best for dairy purposes in the whole world,—especially for the production of milk; and when we take into consideration this fact, and the naturally favorable soil and climate which their native country affords, it is not surprising that we find the Dutch cow of the present time one of the largest of milk-producers. These animals were early imported by the colonists of this country, especially in New York and New Jersey, and have always maintained their good reputation for large yields of milk, although the quality is not quite as rich as that of some other breeds.

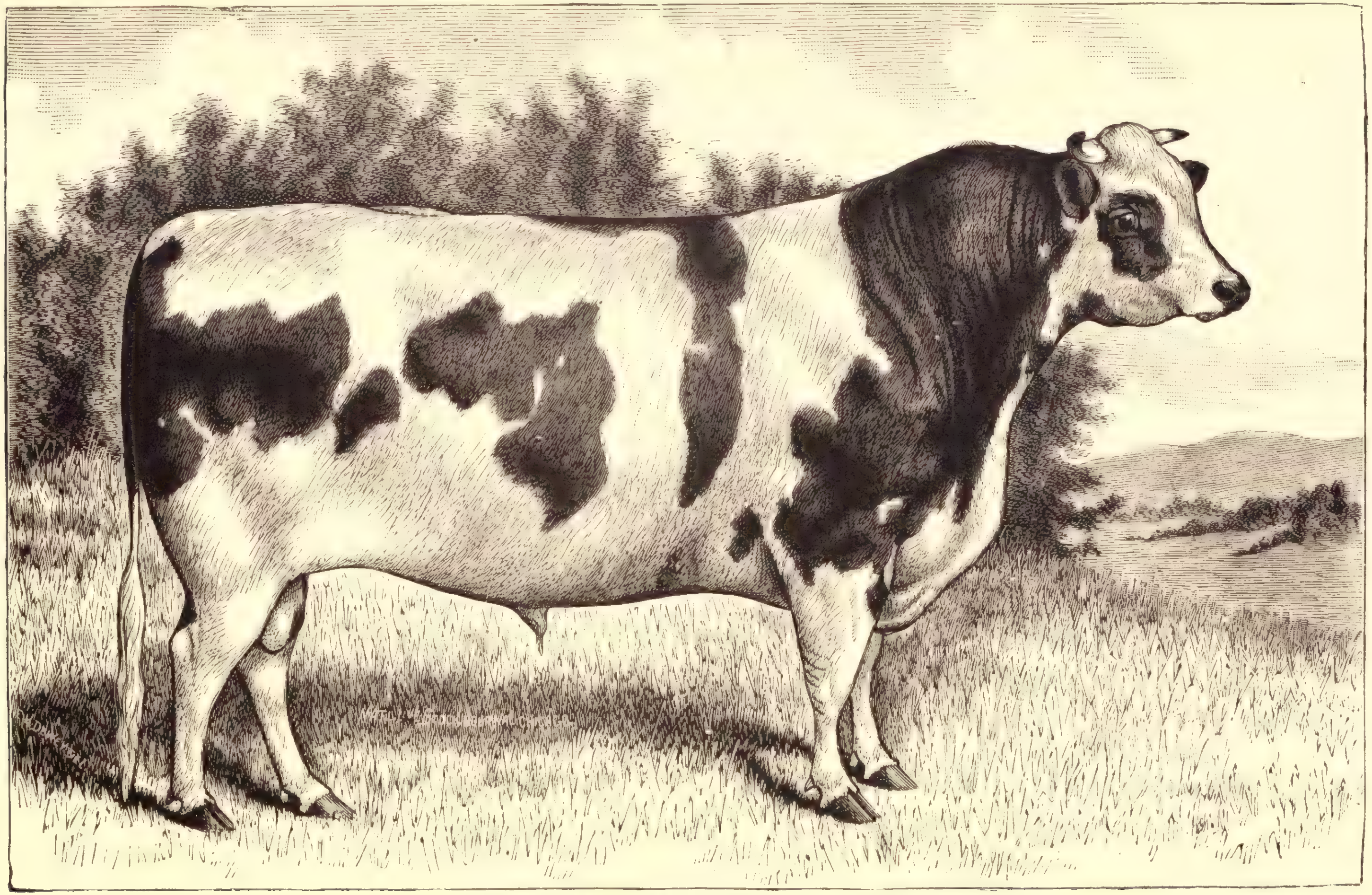
With regard to the origin, varieties, etc., of these cattle we make the following extract from the pen of Prof. Hengerveld, of the Royal Veterinary Institute, Utrecht, Netherlands:

"It may be taken for granted that the Dutch cattle trace their pedigree from the time when the Friesians and Batavians settled on the banks of our great rivers, about one hundred years before our era; they are the lineal descendants of that race of cattle. These nations were engaged in fishing and in tending their herds when not compelled to serve under the Roman standards. The nature of the soil at once indicated their system of agriculture, which was very plain and rude—their object being to get as much milk and beef as possible, while the hides of their cattle were used for garments. Under the Romans, who could boast of a more regular system of husbandry, they improved their farms, and the feeding and management of their cattle. These improvements were entirely founded upon the Roman system. Several large farmhouses remain at the present time as evidences of that ancient system. The old castle, with its various stables, was surrounded by kitchen gardens, woods, meadows, orchards, duck ponds, moats, canals, and ditches, by farmhouses with their cow-houses and barns, while the whole was enclosed when possible by some branch of a river. This is a picture of an ancient Roman villa with its surroundings. It is true from that time up to the present many changes have been effected and the estates are less extensive, but in the main everything shows an exact imitation of the Roman villa. Observing these things, we conclude that during many centuries the lodging, management, and methods of turning cattle to good account have undergone but little, if any change. A continual crossing with the same breed with little importation, or mixing with foreign animals, caused the original race to remain unaffected by foreign influence. Only in the northeastern and in the southeastern borders of our country do we meet with crosses of the German and Flemish cattle.

It is true that sometimes inundations, cattle diseases, and wars have threatened these cattle with decrease and even destruction, but the farmers have gone on breeding with what was left. About one hundred years ago, during the cattle plague, some small German cattle were imported into Friesland. Their management and crossing, and the conditions of climate and soil, soon caused them to possess the qualities of the native breed. The origin and purity of the thoroughbred race may thus be traced back two thousand years.

Description, etc.—"The form proper to this breed of cattle has proceeded from and is identified with their use, lodging, feeding, and management. They have adopted a type or originality peculiar to this stock, and through coupling this has become constant. This bodily construction may be called the *milk shape.*

Varieties.—Notwithstanding the general uniformity of the Dutch cattle, we meet some-



HOLSTEIN BULL, "2d CONSUL."
Property of Dexter Severy & Son, Leland, Ill.

times with varieties, differing in size and beauty; a slight difference is also sometimes to be observed in color and in the shortness of the horns. These varieties are the results of differences in the nature and fertility of the soil upon which these cattle have long been bred and reared.

Thus these cattle may be divided into large, medium, and small. The largest cattle are to be found on the salt water alluvions along the seashore, on the islands, and on the marshy grounds washed up by the sea—lands rich in clay. They are also found on the sweet water alluvions of the great rivers, on the drained lakes, and on the loamy grounds containing a great deal of clay. Another somewhat smaller kind of large cattle, of a finer shape and more beautiful symmetry, is found on the fertile, loamy, and peaty grounds of the lowlands. Medium-sized cattle are found upon the lowest, peaty, loamy, and moist soils, which contain much acid, on lands covered with water plants and grass of small nutritive value, and also on the tilled, dry soils, which contain a smaller proportion of clay and humus. The smallest cattle are found on the diluvions and on the heaths.

Consequently, we find large cattle in the provinces of Groningen, Friesland, North Holland, and in some parts of North Brabant and Limburg. Somewhat smaller cattle, but of fine form, in the northwest part of Groningen, on the peaty soils of Limsterland, along the Yessel, and on some rich loams of South Holland.

Color.—As to color, the following observations may be made: Our farming ancestors kept chiefly white cattle; the remainder were black or brown spotted. The white cattle of the Bavarians are famous in history. Some centuries later we read of white cows and oxen given as tribute to the counts of Bavaria, the princes of Spain, etc. At a still later period date the brown spotted bull and grey cow of Paul Potter. Besides the white cattle, we have now the black and white variegated, and the roan cows of Groningen, Friesland, and North Holland. The black and white variegated in the many truly fine varieties are most numerous. Some foreigners prefer these variegated cattle, doubting the purity of the other colors. This is a great mistake. About twenty-five years ago, the so-called black whiteheads, from the loams of Groningen, were generally preferred and used for breeding purposes. Neither are the red variegated cattle rare. These also belong to the thoroughbred stock.

Horns.—Another prominent characteristic of Dutch cattle is the style of the horns. In this respect they are classed with the Short-Horn races. The direction of the horns is oblique and horizontal, sometimes curved upwards; the downward curve, however, is considered as a desirable mark in milking stock. It is even supposed that the shortness of the horns has a great deal to do with the fineness of the shape. Though it may not be true in every respect, yet the exquisiteness of form and quality depends much upon the network of the horns and the fineness of the hair. It may be shown, on physiological grounds, that long horns take away nutritive matter, especially azotic substances, to the great disadvantage of the bodily development, and consequently the production of beef and milk. Breeders are therefore quite right in paying particular attention to the shortness of the horns.

The milk form, variegated colors, and short horns are three prominent external points proper to all Dutch cattle wherever they may be bred. These are points that they have possessed ever since the formation of the breed, and are strongly hereditary.

Flexibility.—The important quality called *flexibility*, or ease of adaptation to outward circumstances, though belonging, to a greater or less extent, to all races and breeds of cattle, is one of the principal characteristics of the Dutch Friesian breed, and makes them acclimatize in other countries with but little or no change in their productiveness. The cattle imported a hundred years ago into Anspach, the cattle sent to Bremen, Holstein, and Berlin, the Dutch cattle in Hohenheim and Rosenstein, imported by the King of Wirtemburg, the Bohemian Dutch cattle, and these cattle in France, Germany, Russia, and lately America, are so many evidences of this. They all retain their original form, colors, and qualities.

Dairy Characteristics, Quantity of Milk.—"Much pains has been taken in foreign countries to keep an account of the quantity of milk yielded by the Dutch-Friesian cows, and to compare it with the yield of the most productive breeds of other races. In the yearly quantity of milk yielded by the Bern, Simanthal, Allgau, Limburg, and Ayrshire cattle, in some instances, the result has been in favor of the Bern, Simanthal, and Allgau breeds; but generally the superiority has been with the Dutch. The Limburg and English breeds, in which we include the Ayrshire, cannot be compared with them.

The quantity of milk depends much upon the locality from whence the Dutch cattle are selected, whether from a clayey, loamy, peaty, or sandy soil. If we compare the cattle bought by the Germans on the eastern borders of our country with the cattle bred on our rich pastures, we find that the yield of the latter is far superior to that of the former.

In order to obtain a correct comparison of the yield of milk of different breeds, the large, medium-sized, and small animals of each breed should only be compared together.

In my description of the South Holland cattle, the large and medium-sized cows, under which we may also range those of Groningen and Friesland bred on clayey and loamy soils, 3,500 litres* a year I have given as the average yield. It is stated by many a landowner or farmer that, from time to time, their productiveness amounts to 5,000 or 6,000 litres. Cows yielding those quantities are not at all rare. We, therefore, conclude:

1st. The yield, 3,500 litres a year, is but a medium quantity, and cannot be accepted as the yield on the clayey, loamy, and peaty soils of North Holland and Friesland.

2dly. Though portions of North Holland are sandy and dry, yet the cattle belong to the large variety, and these larger cattle are very superior to the best Swiss and Allgau, and even to that exquisite milk breed known under the name of Rosenstein and Wirtemburg.

Quality of Milk.—"Another characteristic of these cattle is the richness of their milk. This also has been often examined and compared with the milk of other breeds; sometimes, however, without regard to the many circumstances on which depend the percentage of cream and butter, viz., constitution, age, manner of feeding, time of calving, milking two or three times a day, milking dry or not, morning or evening's milk, dry or green fodder, winter or summer time, etc. All this waiting for closer examination, it may be said with some certainty that only the mountain cattle races, including the small Alderney cattle, possess a higher percentage. The importation of mountain cattle into our low countries, in this respect, has led to no favorable results. The caseous or cheesy matter in the milk of all our native cattle varies from 8 to 16 per cent., the butyraceous or fatty material from $2\frac{1}{2}$ to $4\frac{1}{2}$ per cent., depending on the various circumstances.

Compared with the rich milk of the best foreign cattle, the difference is but slight; and it may be stated that this breed yield the most abundant quantity of a highly butyraceous milk. The average quantity of cream is 10 to 11 per cent., with which the butyraceous quantity of 3 to $3\frac{1}{2}$ corresponds. Baumhauers' experiments show a difference of cheesy and butyraceous matter of 0,210 to 0,469. From these facts we see that the quantity of butter is such as to allow our best milch cows to vie with any other breed. Except the accurate experiments and examinations of Dutch milk by Professor Baumhauers, no others are known to me. I have intentionally pointed out the quantity of butyraceous milk matter, because, judging from the information derived from abroad, some foreigners doubt this, by which they disparage unjustly the quality of this breed; therefore, I add, that caseine, butter, and sugar of milk are to be found in their milk in as large quantities and of as excellent quality as in any other milk breed, with the exception of the Alderney, and possibly some of the mountain cattle, which they greatly surpass in productiveness."

From the above authority, the high estimate placed upon the cattle in their native

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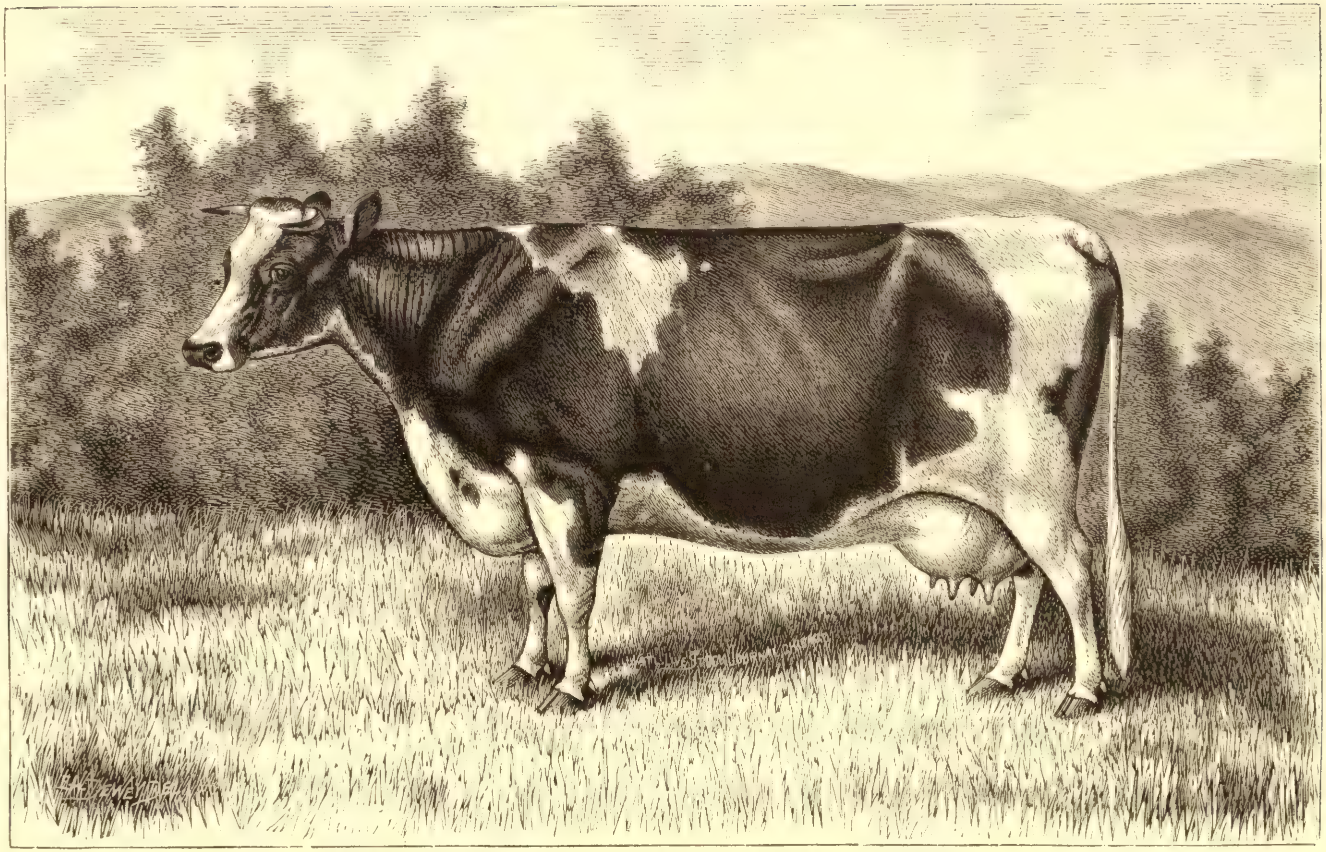
*The litre is nearly the same as our wine quart, the difference being so slight as not to be worth considering in this connection.



IMPORTED HOLSTEIN HEIFER, "MEIKA."
(Age 2 years, weight 1,250 lbs.) Property of Geo. E. Brown & Co., Aurora, Ill.

county will be seen. In this country they are highly valued as milk producers, and are most commonly found in the best grazing sections, such as the Western and some of the Middle States, to which they are admirably adapted. They are noted more particularly for large yields of milk rather than the richness of its quality, although owners of this breed claim that large quantities of butter can be made from it. It is also especially adapted to the manufacture of cheese.

HOLSTEINS.

THERE has been much discussion among breeders in this country with regard to the use of the term "Holstein" as applied to the cattle which it is sometimes used to represent, it being often used in connection with "Dutch," which is inappropriate, since the Holstein races, of which there are several, differ in many respects. Professor Hengerveld, previously quoted, says in this connection:

"In the Netherlands Herd Book every animal is described from the province in which it was bred: 'Noord Hollandsch veeslag,' 'Friesche veeslag'—literally North Holland kind, Friesian kind. In the certificates of breeding required to entitle imported animals to registry in America, these two kinds are regarded as identical, and are described as 'pure North Holland, or Friesian black and white piebald cattle.' Upon arriving in America, however, they are popularly given the name 'Holstein.' This name is a peculiarly unfortunate one, from the fact that there is a breed in the province of Holstein differing widely from this breed, to which Europeans have very properly attached the name Holstein. Hence it is very likely to lead to misunderstanding and confusion as intercourse increases between American and European breeders; besides it robs the true originators of the breed of the honor justly due them."

Without stopping to discuss the question, we will simply state that the term "Dutch" cattle is generally understood to apply to the common breed in Holland, while the name "Holstein" has become popularized in this country, and is regarded as referring to the large improved black and white cattle, derived from North Holland and adjacent provinces, or the descendants of these animals. Mr. Charles Houghton of Boston, explains how the name "Holstein" came to be adopted, as follows:

"Previous to and for some time after 1871, Mr. Winthrop W. Chenery of Belmont, Mass., was the principal if not the only importer of Holstein Cattle for purposes of improvement.

In March, 1871, about ten persons, to whom Mr. Chenery had previously supplied one or more Holstein animals each, at his suggestion united with him in an association called The Association of Breeders of Thoroughbred Holstein Cattle, with a constitution and by-laws, and a register of all the pure-blooded animals of that race owned by them. The principal object of this association was and is to keep and preserve a register of animals known to be of pure blood, and of their progeny, including future importations.

At that time the persons uniting in the association knew of no name by which this race of cattle were generally known in Holland and the neighboring provinces. They had been usually called 'Dutch' or 'Holstein' by Mr. Chenery and his associates.

In 1864, Mr. Chenery was requested by the Department of Agriculture, at Washington, to contribute an article upon the cattle in question for publication in the Commissioner's Report. The paper was prepared and forwarded to the Department with the title of the 'Dutch Cattle.' In due time the article appeared in the Commissioner's Report with the title changed from 'Dutch' to 'Holstein Cattle.' This circumstance, together with the fact that no other name more appropriate could be suggested, decided the question of name, and Holstein was adopted."

Since that time large additions to the number of these cattle in the United States have been, and are still being made by frequent importations, as well as by breeding, where they seem to adapt themselves readily to the climate, and grow as large as in their native country, the pure-bred descendants of those imported fifteen or twenty years ago being fully as valuable in all respects as fresh importations of the finest selections in Holland. The pure-bred Holstein bull almost invariably marks his progeny, even if bred to a Short-Horn.

Description of Holsteins.—The general form of the Holstein breed is that indicative of great milking quality, the udder being very capacious, and of unusual depth and breadth, with well developed and prominent milk veins running well forward, and good sized teats set well apart. The head should be finely moulded, forehead and face somewhat concave; nose dark, nostrils large; eyes rather full, clear and sparkling, yet mild; ears moderately large and standing out from the head; horns thin, short, and well curved. The body should be compact and massive; well formed, with rather broad hind parts, straight back, round but moderately bent ribs; well developed belly; fine bones, and suitably stout, but not heavy legs; smooth joints; thin, mellow skin; soft, short hair; tail rather long and slender, with a thick bushy tuft of hair at the end.

A recent writer in Holland in describing the beau ideal of this breed, says, in connection with the milking qualities: "The udder should be broad and drooping, well developed milk and blood vessels; veins on the belly and about the udder to be proportionately broad and vigorous, and of a wen-like swell, and the veins of the udder and inner hams to spread net-like; the openings through which the milk and blood veins enter the body to be large and roomy. A cow thus formed is also apt to show a perfect escutcheon."

The color is black and white, spotted or mottled in greater or less inequalities of proportion on the body. These cattle are gentle and docile, and the oxen, for those of such large size, make excellent workers. A four year old bull of this breed is said to girt seven feet and ten inches, the length of body eight feet and ten inches; height four feet and eleven inches; weight 2,465 pounds. When fattened, the oxen often attain a weight of from 2,500 to 3,000 pounds, while the cows range from 1,200 to 2,000 pounds. They are a hardy breed and large feeders.

Dairy Characteristics of Holsteins.—This breed is reputed to exceed all others in the amount of milk produced. Unlike the Jerseys and Guernseys, Holsteins are remarkable rather for the quantity, than richness of milk, although in this latter respect they excel some breeds, the milk being of very fair quality, and is perhaps better adapted to the manufacture of cheese, than butter. Their prominent characteristics have caused them to be much sought after, especially in those sections where pasture is abundant, and dairying is one of the leading agricultural industries. By tests, as shown by experiments made at two of the agricultural stations of Prussia, in one case with the same care and in the same time, the Ayrshire produced 2,247 quarts of milk, and the Holstein 5,677 quarts; the first consuming nine pounds of hay for every quart of milk, and the latter five pounds. It is stated by good authority that one cow of this breed, which had recently been imported, and which had dropped her calf on the 15th of May, weighing one hundred and one pounds, gave from the 26th of May to the 27th of July, according to a carefully kept record, four thousand eighteen pounds and fourteen ounces of milk.

The largest yield of milk in any one day was seventy-six pounds and five ounces, or thirty-five and one-eighth quarts. The average of this cow for ten days was seventy-four and forty-seven hundredths pounds per day, and the amount of cream produced from this milk was twenty-two and seventy-one hundredths per cent. Six days' milk of this cow produced seventeen pounds and fourteen ounces of butter. The above is certainly an excellent record in butter production as well as milk. The cow of this breed named Texelaar, formerly owned by

Mr. Winthrop W. Chenery of Mass., gave a record of seventeen pounds and fourteen ounces of butter per week; a heifer of this cow,—Texelaar 9th,—gave fourteen pounds per week; Snow Flake at two and a half years, ten pounds per week. Messrs. Smith & Powell have given the result of tests with their breed in the Dairy Department as follows:

"Neilson, seven years old, has given 74 lb. 12 oz. of milk in a day, 2,043 lbs. 12 oz. in one month, 8,668 lbs. 7 oz. in five months. Jannek, seven years old, 71 lbs. 12 oz. in one day, 2,008 lbs. 3 oz. in one month, 8,202 lbs. in five months. Aggie, six years old, has given 84 lbs. 12 oz. in one day, 2,362 lbs. 2 oz. in one month, 8,231 lbs. 1 oz. in four months. Her fifth month is not yet completed. Ægis, six years old, 82 lbs. 12 oz. in one day, 2,197 lbs. 12 oz. in a month, 9,522 lbs. 7 oz. in five months, and 10,648 lbs. 3 oz. since commencing her record, February 22d, to date, August 16th. Sappho, three years old, has given 64 lbs. in one day, 1,717 lbs. 6 oz. in one month, 4,381 lbs. 6 oz. in three months. Lady of the Lake, two years old, dropped her calf on February 20th, when about twenty-two months old, and gave, before she was two years old, 45 lbs. 13 oz. in one day, and 1,284 lbs. 9 oz. in one month. She has given, in five and a half months, 6,624 lbs. 2 oz. Imogene, two years old, gave 47 lbs. 4 oz. in one day, 1,227 lbs. 6 oz. in one month, 4,598 lbs. 15 oz. in four months.

As we are short of pasture, we depend mainly upon soiling them. They are turned to pasture part of the day, and during the night in yards. The balance of the time they are kept in the stable and fed grass, oats, and fodder-corn, each in its season. Our grain feed is composed of bran and ground oats, equal parts, with about enough corn meal to supply each cow half a pint per day. Of this mixture we feed our two-year-old cows 5 lbs. per day; three-year-olds, $5\frac{1}{2}$ lbs. per day, and older cows, 8 lbs. per day. Earlier in the season we fed more bran in proportion to the feed, and twenty-five per cent. more weight."

From a report of the Elmira Farmer's Club, we obtain the following record of Colonel Hoffman's herd of Holsteins, of Horseheads, N. Y., it being the most complete of any of this kind that we have been able to procure. The first seven are thoroughbreds and the last four grades:

	Lbs. Milk.	Days in Milk.	Cream Standard.	Average lbs. Milk, 4 years.
Janeka,	10,228	335	11	10,084
Jufrou,	12,992	365	13	11,820
Gentle Annie,	9,143	350	$11\frac{1}{8}$	9,076
Holland Princess,	7,014	291	13	——
Beauty,	11,313	365	$11\frac{1}{2}$	8,218
Belle,	9,901	323	$12\frac{7}{8}$	7,650
Constance,	8,750	318	$12\frac{1}{2}$	——
Peitji,	9,667	350	$13\frac{1}{8}$	——
Louise,	9,468	337	$16\frac{1}{2}$	——
Black Twin,	8,998	313	$13\frac{7}{8}$	——
Polley,	9,829	337	$12\frac{5}{8}$	——

Average of 11 cows for one year,	9,775 lbs.
Average of 5 cows for 4 years,	9,369 lbs.
4 grades, average,	9,491 lbs.
7 thoroughbreds, average,	9,906 lbs.

The above is interesting, inasmuch as it shows not only the amount of milk yield per year, but the number of days in which each animal was in milk. He also averaged in one year from six full-bred cows and four grades, 8,740 lbs. per cow. In their native country, Villeroy reports yields of this breed from 11,000 to 13,000 lbs. per cow, and butter yield from 447 to 538 per cow. The herd of G. S. Miller of Peterboro, N. Y., averaged in five years 8,738 lbs. of milk per cow, the largest yield from one cow for one year being 14,027 lbs.

Hon. Wm. A. Russell of Lawrence, Mass., reports a cow that in 1875 gave 16,274 lbs. of milk; in 1876, 12,274 lbs.; and in 13 months from May 1, 1877, to June 1, 1878, 13,232 lbs. The Unadilla Valley Association reports a cow that gave in two years 26,905 lbs., the largest record for one year being 14,312 lbs.

It will be seen that although the milk of these cows is not as rich as some in the butter element, yet the quantity produced makes up in a great measure for this deficiency. For milk and cheese dairies these cows are much sought, but where richness of milk and cream for the table, or the manufacture of what is termed first-class "gilt-edged" butter is desired, the Jersey or Guernsey breed is usually preferred.

Holsteins for Beef. — Holsteins fatten quite readily, the oxen frequently attaining the weight of from twenty-five hundred to three thousand pounds, while a well fattened, good-sized cow of this breed will sometimes nearly or quite reach two thousand pounds in weight. They are, of course, not equal to the Short-Horns and Herefords in this respect, the latter being pre-eminently beef breeds, as at present bred, but it cannot be denied that they make, when well fed, excellent beef. The cattle are generally of large size at birth, weighing from seventy to one hundred and twenty pounds, and when fed according to a judicious system, thrive and increase in size rapidly, making excellent veal.

SWISS CATTLE.

THESE excellent cattle are becoming quite popular as a dairy breed in the United States. Switzerland has long been renowned for its kine, and their product of cheese and butter, and this breed has a high reputation in many parts of Europe, especially in France, where they are much esteemed for dairy use. In their native country they have been reared and kept for centuries especially for the dairy, where they are wintered in the valleys on the coarsest food. As soon as the snow melts from the southern mountain slopes they are driven to their elevated pastures, which, as the season advances, are gradually changed for the higher ranges. Here they graze among the rocks and rugged steeps, often at an elevation of more than 7,000 feet above the level of the sea. For four months during the year they are kept on the most elevated feeding grounds, where a large number will be attended by one man, who combines in himself the office of herder and dairyman. Here they remain feeding, often at the very edge of the snow fields, until the short summer of this region is over, when they descend to the more sheltered pastures and valleys again, being driven down by the autumn storms.

Cheese is the chief dairy product, and it is said that each cow produces by the end of the season of four months, an average of 225 pounds, and that the best cheese of the country is made upon these elevated pastures, its manufacture being conducted in the most primitive manner in the lonely little chalets perched upon the mountain side.

In consequence of the surroundings and habits of these cattle, extending through so many successive generations, they have become hardy and vigorous, healthful in constitution, and active, while they are thrifty feeders, although not as particular as to the quality of their food as some races. It is, however, true of this breed as with all others, that the better the quality and quantity of food given, the better the results in milk yields.

The Swiss cattle of the plains and those near the large towns are for the most part kept confined in close, unhealthy stables. Mr. S. H. M. Byers, the United States Consul at Zurich, says of these stables:

"The extreme *warmth* of these stables, in almost every case, was as noticeable as the

SWISS BULL, "FREDERICK SCHILLER."

(Three years old.) Imported and owned by Geo. W. Harris, Wethersfield, Conn.

simple quality of the food. Swiss cattle stalls are, almost universally, long, very low, rectangular attachments to the barns. They are always built of stone, with walls one to two feet thick. The stalls are usually ceiled overhead, and are often plastered throughout. The floors are likely to be of stone or cement, and the single oak door at the end of the rectangle is as tight-fitting and airless as the doors of the people's houses. There are no windows, unless the one or two little barred holes through the stone walls are to be called windows. There is no ventilation, and the place is very nearly dark. The hay is gotten into the little low mangers through small openings in the wall, between the heads of the cows and the hay barn. The atmosphere in these stalls is hot and horridly impure.

The stalls are clean and nice beyond comparison. They are swept and littered two and three times a day. It is their heat only and want of ventilation that are nearly unendurable. The litter or bedding is usually slough-grass, poor hay and straw, and sometimes sawdust. Cows that are kept by peasants in the neighborhood of the mountains are taken out and pastured on the high Alps during the short summer. This, however, is a comfort denied all Swiss cattle of the plains, and cattle near towns. In the stalls the cows stand in rows, with scarcely a foot of room between them; indeed they have barely room to lie down at all.

As I have already said, grass and hay usually form the only food the cows receive. In the summer the cow is fed all the fresh cut grass she will eat. In the winter, she is allowed, usually, about seven Swiss clafters of hay (a clafter measuring 216 cubic feet). This would average near to 30 pounds, or, at selling prices, about 19 cents' worth of hay to the cow, daily. In exceptional cases only are two or three cents' worth of turnips, potatoes, or shorts, added to this daily ration. There are no pasture fields, aside from the high Alps, so the cow receives her grass ready cut, and in her manger out of reach of flies."

These cattle are well adapted to hilly and mountainous districts, and wherever they have been distributed in this country, have given the best of satisfaction to their owners. Being extremely hardy, they are little affected by change of climate, and are admirably adapted to mountainous localities or such as may sufficiently approach their native habitat to require for their most profitable occupancy such a breed as this, and where one less hardy would not prove profitable. They are regarded by some as destined to be the favorite dairy cow of the future.

Description. — There are different races of cattle in Switzerland peculiar to certain localities. These races seem to be modifications to a greater or less degree of the principal breed, the — "brown Switzer," — which we describe, and which is superior to all others in that country for milk production. During the past few years there has been a marked improvement in the Swiss cows. Having formerly been bred solely for milk, no attention whatever was paid to beauty of form or color in breeding. The old-style cow of this breed therefore had a large, coarse head, with a receding forehead, high coarse shoulders, coarse skin, and a large frame with an undue preponderance of bone.

At present, however, the Swiss cow is an animal of very different type, and while it may differ somewhat in fineness from the small-boned Jersey and some other breeds, yet the change from the former type is a marked one, and has also been accompanied with improvement in milk production; so that the Swiss cow of to-day, as a milker, may be classed among the best performing races known to the dairymen.

The Swiss cattle are large and well formed, the usual weight of the cows being about 1,200 to 1,300 pounds, exceptional weight being 1,500 pounds. Mature bulls range from 2,000 to 2,700 pounds. Those kept in the higher Alps, where the herbage is scanty, generally average about 900 pounds. In color they vary from a light to a dark chestnut brown ; the lighter being denominated by some writers as a "mouse color." The light shade is particularly observable in a narrow line along the back, in the inside of the ears, and in tufts of hair between the horns. The horns are rather short, of smooth texture, and tipped with

black. The nose is black, and is surrounded by a meal-colored band; a yellow strip extending from the middle of the lower lip to the upper lip, and up the sides of the nostrils. The mouth and tongue are generally dark-gray or black; the switch and hoofs are also black; udder well developed, white, and smooth. The shoulders are large, the thighs wide apart, hind quarters heavy, and the hind legs straight. The disposition is extremely kind and docile. Their marks are very persistent, a fact which denotes the purity of the breed. Other races, such as the Fleck, and the light spotted cow of the Simmenthal, were formerly held in high esteem, but the brown Switzer is generally considered superior to all other Swiss breeds for dairy purposes.

Swiss Cows for the Dairy.—That the Swiss cow possesses valuable dairy qualities cannot be denied, as has been shown by repeated tests in this country by competent and reliable persons. Mr. D. G. Roberts of Pittsfield, Mass., an ardent advocate of this cow, and one who places a high estimate upon her dairy characteristics, says: "She is a coarse necked, heavy bodied cow, and knocks all my theories higher than a kite," her chief attraction seeming to be in good works at the pail, rather than in any external beauty. The Swiss cow "Bessie," owned by this gentleman, has the following record, as given by him: Yield of milk from November 1st to December 31st of the following year, 10,905 pounds; yield of butter for the same time, 573 pounds. She dropped her calf August 11th of that year, and was not dry during the fourteen months of the test. From the 1st to the 13th of August the milk was not weighed. The feed of this cow was roots, meal, and bran in winter, the quantity not being stated; grass and fodder corn were fed in summer. He also says that he tested her with a Jersey cow for three months, and that under the same treatment and on the same feed, in quantity and quality, the Swiss cow produced an average record of fifty-five pounds of butter per month, and the Jersey cow forty-five pounds. In the month of February of the same year, the Swiss cow made fifty-seven pounds of butter, and the Jersey forty-five; in March, the Swiss cow made sixty-seven, and the Jersey fifty-two pounds. The feed was good hay, corn fodder, roots, and corn meal. "Geneva," a cow of this breed, imported by Mr. D. G. Aldrich of Worcester, Mass., is stated by that gentleman to have given thirty quarts of milk in a day, averaging for twelve days 26½ quarts daily, and has yielded three pounds of butter in twenty-four hours milking. If the above records, as given by the owner of these cows, can be taken as a fair standard of the breed, it certainly merits a place among the best of our dairy stock, as far as the production of milk and butter are concerned. Mr. Byers, the authority previously quoted, gives, in his report on the Swiss milk industry, the following statement with respect to the dairy qualities of this breed of cows:

"Not far away from Einsiedeln I found a small herd of cows kept by a Mr. S., who is a very exceptional 'feeder' for a Swiss. He adds bran, shorts, and vegetables to his hay, and has an extraordinary pride in his cows. For fifty years Mr. S. has been keeping cows on this same farm. Every detail of his establishment was given me, copied from carefully kept records. The average results were not materially different from the average of other small select herds. His cows give 10 litres of milk each daily, year in and year out. He has, what is a great exception, well ventilated cow stalls. He gives the usual allowance of hay, viz., 30 pounds daily to the cow, and a spoonful of salt every other day. All his milk goes to neighboring factories, and is paid for at the stall when milked, at four cents a quart. His fine herd averages about 1,300 to 1,400 pounds in weight. There are exceptionally good milkers among them. Some of the five and six years old give fifteen quarts a day for one year after calving. One cow gave eighteen quarts a day two months after calving. Another cow, eight years old, did about as well. Another gave twenty-one quarts of milk for three months after calving, and an average of twelve quarts during the remainder of the year. She produced twenty-one pounds of butter per week for three months, and

extraordinary amounts the year through. It is noticeable that this cow received almost no artificial food. She is also a rare exception, even for the Switzer breed.

Perhaps no more reliable statistics as to the milk production exist than are kept by the Anglo-Swiss Condensed Milk Company of Cham, Switzerland. This is, I believe, the largest and most successful concern of the kind in the world. It uses the milk of not less than five to six thousand cows at the principal factory in Switzerland, and of as many more at the company's condensing establishments in England.

The company's director, Mr. Geo. H. Page (an American), feeds, as private property, the very finest herd of the brown 'Switzer' cows I have found in the country, and it is principally this herd of cows, and not the milk condensing factory, I purpose reporting briefly at present. Mr. Page keeps his herd of thirty cows in a large rectangular house, with brick walls and tile roof. The very broad ceiling is unsupported, except by the outer walls. It is very high, and the whole immense room where the herd stands is plastered throughout, and furnished with every modern improvement as to mangers, floors, ventilation, etc. This fine herd ranges in age from three to five years, few being over three years, and the cows average in weight 1,400 English pounds. One of them, a four years old (an exception of course) weighs 1,810 English pounds.

The cows of this herd are perhaps in all respects above the average of the 'Switzers,' as they were mostly choice selections, and paid for accordingly, at prices reaching in single cases $200 to $240.

Mr. Page feeds *only grass and hay*, summer and winter, and that is worth bearing in mind. His cows are taken out to exercise daily, but never graze. Twenty-six of these three-year-old heifers produced in April, May, and June (after first calf) 28,076 litres of milk, or twelve quarts per cow daily—a large average when it is remembered that it includes almost every cow in the herd, and that none were at the best milking age. Mr. Page counts on these twenty-six cows averaging fifteen litres daily this coming year. Three of the 2¾-year-old heifers gave at highest point 19½ quarts daily, and averaged 10 quarts the year through. Three others, after second calf, gave 24 quarts daily for three months, and maintained a high average throughout the year.

Mr. Page's advice to those who would buy Swiss cows for importation would be to buy for 'in-breeding' only, and not for crossing. He retains only the very best calves, perhaps one in six, and sells the remainder to the butchers. It is worthy of note here that Italy and other States are rapidly buying up choice specimens of Swiss cows for exportation, so that cattle growing here bids fair to assume larger and more profitable proportions.

The milk condensing company of Cham pays at present to farmers for many miles around an average of 13½ centimes, and the farmers, with their dear land and their dear cows, are apparently satisfied. The reports of the milk and butter of the many thousands of cows contributing to the condensing factory at Cham are most interesting. During the year 1881, the condensers used the milk of between 5,000 and 6,000 *grass and hay-fed cows.* They were milked about nine months, and produced on an average 5,315 *pounds* of milk per cow; this is 19.7 pounds, or 9.8 quarts, of milk per cow daily for the milking season."

KERRY CATTLE.

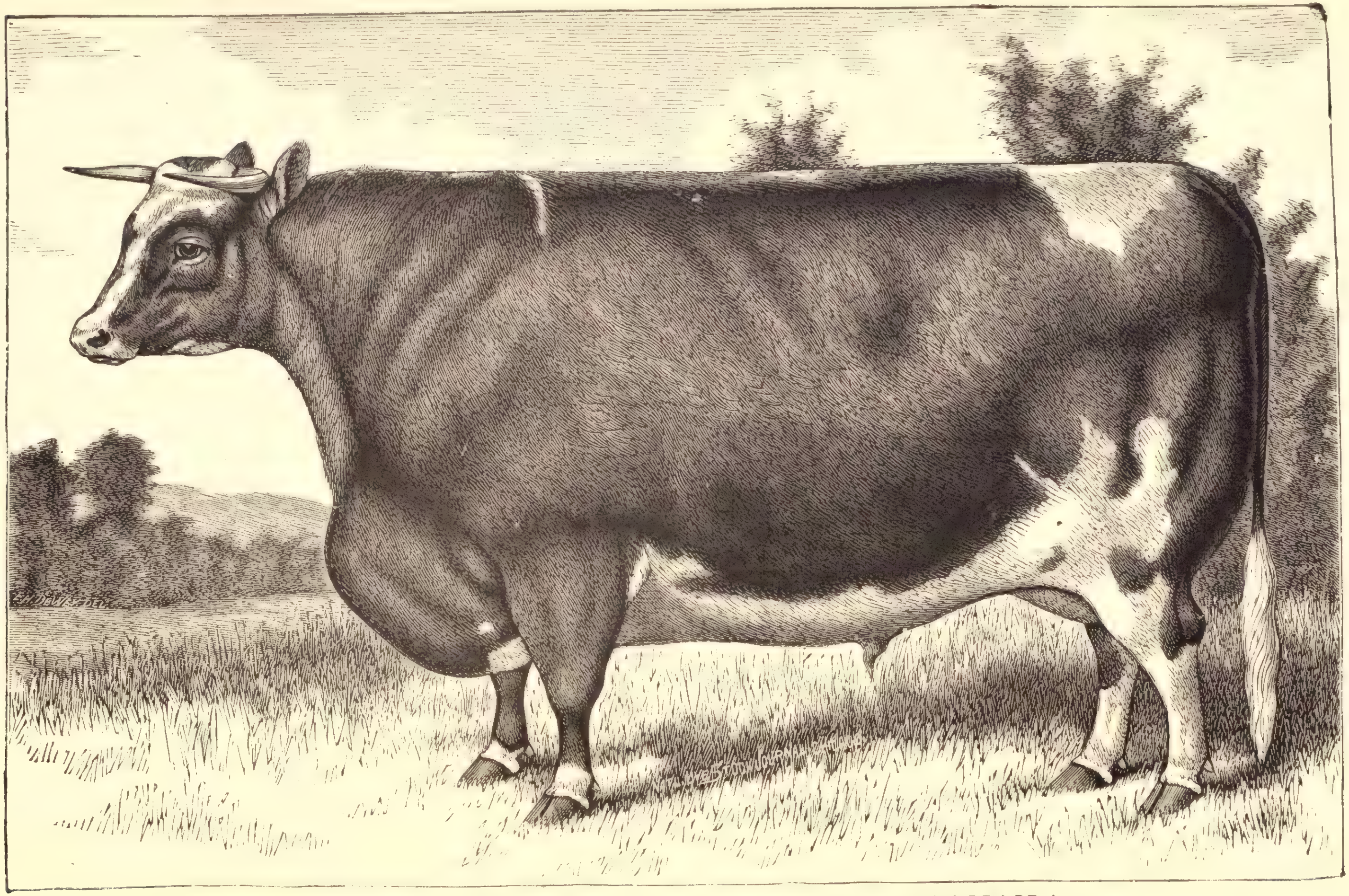
THIS breed originated in the county of Kerry, Ireland. As they have some points which may be interesting to the farmer to examine, we submit the following concerning them from the pen of an English writer, who, as it will appear, is to some extent a breeder also.

Description.—"The characteristic points of the breed are unmistakably well marked. The size is small. The legs, in most cases, are very short in proportion to the size of the body. The head is somewhat small, though the muzzle is rather long and clean. The lips are thin. The expression of the countenance is pleasing, and the eye is particularly clear and fairly prominent. A symptom which is most indicative of purity of the breed is the 'turn-up' of the horn, which is of medium length. Occasionally, however, the horn will, after turning up, turn backwards. The nicety of the horn and the manner in which it is set on adds immensely to the style. The neck is not massive at the juncture with the head, but it thickens gradually, and affords reasonable covering to the shoulders. The latter are flat and thin. The dorsal vertebræ rise more than in other cattle, which sometimes gives the back an irregular appearance. The ribs spring well, especially the last, or those approaching the hip; this makes the body very compact. The loins are of medium width, and the hip not prominent. The distance between the hip and the setting on of the tail is not considerable; the latter hangs neatly, and is well concealed by the adjoining bones. The chest is full and deep, and the hind-quarters long, but rather light. The favorite color is black; though black-and-white, brown, and red are by no means uncommon. The coat is invariably fine and thick, and the hide elastic and mellow, showing great capacity for the production of flesh and fat.

The disposition to fatten is likewise a remarkable peculiarity in the breed; it must, however, be understood that they take a pretty long time to come to full maturity. At the age of three or four years we find them in the market, killing about 3 cwt. of beef; though, as a rule, the fattening as distinct from dairying, is not carried out to any appreciable extent. The prevailing custom is to milk for some years, and, subsequently endeavor to put into condition for the butcher. Very few male animals are reared, except those intended for breeding. If a person were to travel the entire length of the 'kingdom of Kerry,' he would probably not see a dozen bullocks of the native race. In fattening, the animals thrive with great rapidity on artificial food. The beef is well marbled, and for flavor and tenderness is not excelled by that of any other breed. We have known some of the nobility to put themselves to much inconvenience in order to secure a round of well-fed Kerry beef for special occasions. Bearing all this in mind, it is surprising that more attention is not bestowed on the propagation of the breed. Some years ago it was suggested that a society or company should be formed, with the object of improving and spreading the animals in suitable localities; but the suggestion has not yet been acted upon. Should such a body be formed, the breed could, unquestionably, be carried to a very high state of perfection.

It is, as already observed, the hardy constitution of the Kerry that most enhances its value; for dairy purposes especially a remunerative yield is obtained on what would be to other animals 'starvation fare.' In the depth of the winter season I have not only known the animals to live jumping from rock to rock, and from cliff to cliff, picking a coarse, scanty bite from amidst the snow-clad mountains, but, with very small additional keep at the farm steading, whither they come to be milked morning and evening, to actually thrive under the circumstances. The hair is thick, but fine and long—provision of nature typical of cold latitudes.

What, however, is far more singular in the constitution of the breed, is the readiness with which it adapts itself to circumstances of a wholly reverse character. In acclimating breeds of cattle, sheep, or pigs, the transition must be gradual; but with the Kerry we have had



GRADE SHORT-HORN STEER, "JOHN SHERMAN."

Winner of Grand Sweepstake Prize for best animal of any age or breed. Property of J. D. Gillette, Elkhart, Ill.

it suddenly and indiscriminately transferred from its home in the mountains to the richest grazing valleys which our island can boast of without experiencing the slightest change as regards health. Not alone this, but we have seen the beasts ushered at once into the dairy sheds, and there confined for years in the closest bondage without any apparent effect on the constitution.

Dairy Properties.—As regards the milking properties, they have been partially indicated in the foregoing remarks. The udder is extremely well formed, and the milk veins highly developed. I have had Kerries that milked sixteen quarts per day for a long period of the summer, although fourteen or fifteen quarts for three months after calving is a pretty general yield where a good system of feeding is adopted. Twelve quarts must be looked upon as a good average for an entire season; in remote and coarse districts, where the beasts have to maintain themselves on inferior herbage, nine quarts is probably nearer the mark. The milk largely abounds in cream, and is nicely flavored. The butter is rich, and for color and taste it stands unrivalled.

One or two Kerries in the herd are sufficient to give the entire yield of butter a most agreeable color and flavor; it is principally for this reason that we never like to be without a few of these animals. Whereas it will require from ten to twelve quarts of the milk of other breeds to produce one pound of butter, we have frequently realized the same amount from eight or nine quarts of milk of the Kerry; of course the general feature is more or less shared in, that the proportion of butter is regulated in accordance with the feeding."

Another writer of the *London Live Stock Journal* says: "I have before me an instance of an Lilliputian Kerry having produced 13 lbs. of butter per week, a marvelous yield, considering her size, for the Kerry cow is usually much smaller than the Jersey. But the extraordinary statement about this is, that three pints of cream made one pound and four and a half ounces of butter. Suppose the cream to be 25 per cent. of milk, which is not uncommon, there would be six quarts of the latter. This would be at the rate of one pound of butter to a fraction over four and a half quarts of milk."

SHETLAND CATTLE.

THESE are the smallest cattle in the world, and compare with the common-sized breeds about as the Shetland pony does with the horse of ordinary dimensions. When fully fattened, the carcass of a Shetland cow is said to scarcely exceed in weight that of a long-wooled wether. An English writer says of them: "These little creatures are excellent milkers in proportion to their size; they are very hardy, are contented with the scantiest pasturage, come early to maturity, are easily fattened, and their beef surpasses that of all other breeds for tenderness and delicacy of flavor. The diminutive cows of this breed are not unfrequently coupled with the Short-Horn bulls, and the progeny from such apparently preposterous unions not only possess admirable fattening qualities, but approximate in bulk to their sizes. These curious and handsome little creatures, apparently of Scandinavian origin, are so peculiarly fitted to the circumstances of their bleak and stormy habitat, that the utmost pains should be taken to preserve the breed in purity, and to improve it by judicious treatment."

The importation of these cattle into this country could not be recommended under any circumstances whatever, except as curiosities, but in their own native land they are exceedingly useful, since, like the Shetland pony, they will subsist on the most scanty fare, and will thrive where almost any other breed could scarcely exist.

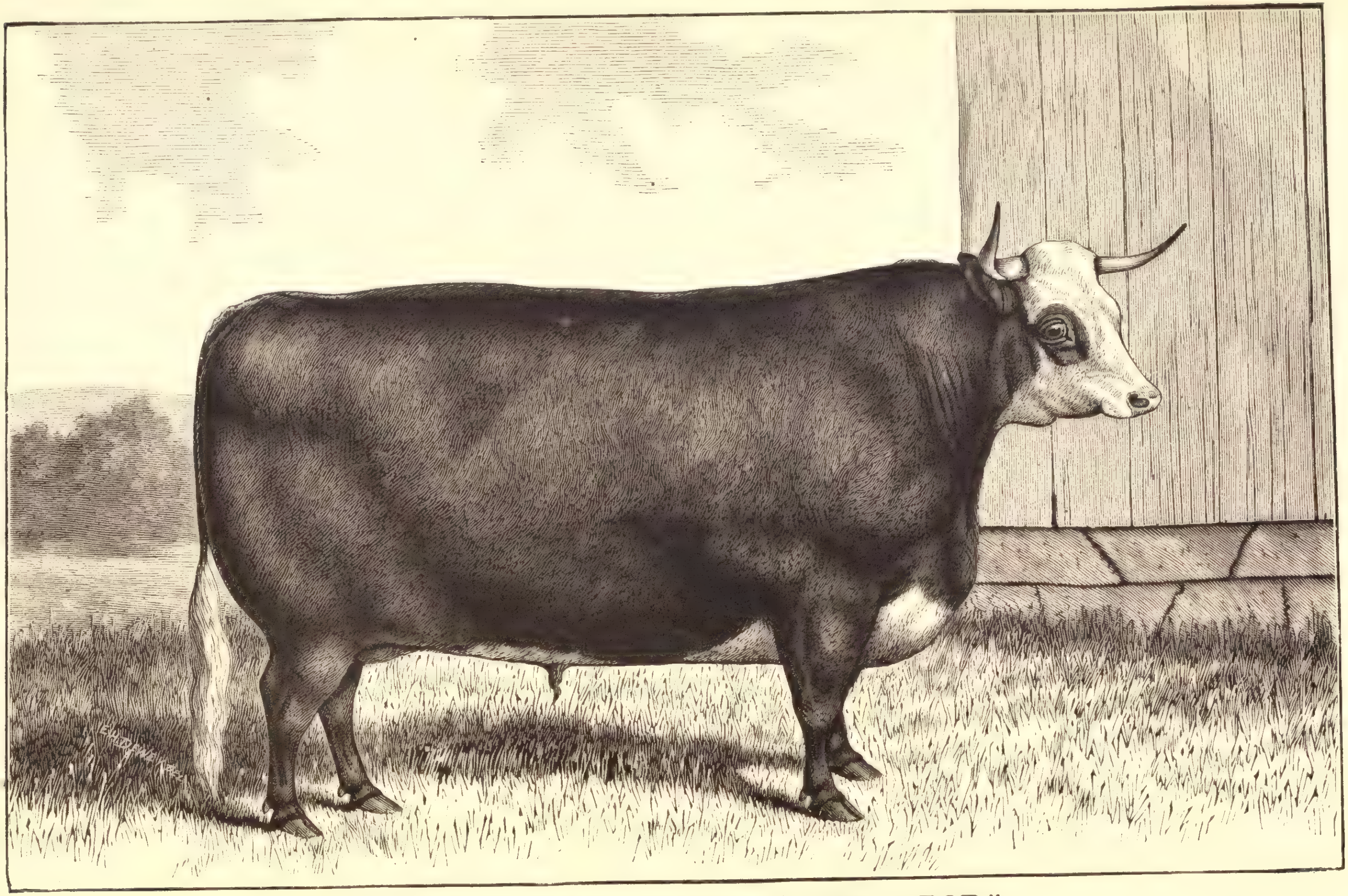
Grades of Various Breeds.—The term breed, in its proper meaning, applies only to animals of the same species, possessing, besides the general characteristics of that species, other qualities or characteristics peculiar to themselves, and which they transmit with certainty to their offspring. When these qualities have thus become permanently fixed, then the claim may be well founded that a breed has been established. Grade cattle may be defined as the progeny of any pure breed crossed upon the native stock of the country, or upon any cattle whatever not of its own breed. Hence we have grades of the Short-Horn or Hereford breeds with the native cattle, that make excellent beef; the Holstein, Jersey, Guernsey, or Ayrshire for improving the common stock for the dairy; the Devons or Herefords for working cattle; the cross between the Short-Horns and Herefords, etc. Grade is of course a very indefinite term, since it includes the first cross as well as the fourth or fifth, and is also applied to a cross between pure-bred breeds of different kinds, and pure-bred animals and native stock; neither does it indicate how near the grade approaches the thoroughbred. To aid in this respect most breeders and writers have adopted the following progressive scale:

1st	cross	produces	$\frac{1}{2}$	or 50	per cent.	thoroughbred.
2d	"	"	$\frac{3}{4}$	or 75	"	"
3d	"	"	$\frac{7}{8}$	or 87.5	"	"
4th	"	"	15–16	or 93.75	"	"
5th	"	"	31–32	or 96.875	"	"
6th	"	"	63–64	or 98.437	"	"
7th	"	"	127–128	or 99.218	"	"
8th	"	"	255–256	or 99.609	"	"

Flourens arrived at the opinion, after experimenting by crossing the dog and jackal, that the fourth class was practically thoroughbred, the fourth generation of these hybrids, when the dog was the male parent, not being distinguished from the dog, while the fourth cross in the other direction could not be distinguished from the jackal. While for practical purposes, such as the production of beef, a fourth, fifth, or sixth cross of a pure-bred male of the best beef breeds, if properly managed, may be equal to what are termed thoroughbreds of that breed, still, for breeding purposes, such a grade would be very inferior to the pure-bred animal.

The more pure blood the animal possesses, or the higher the grade, the better of course will be the animal, other conditions being equal. When the farmer is not able to purchase pure-bred stock, the next best thing will be to procure a thoroughbred bull of the breed that seems best adapted to his locality, circumstances, and use, and grade up the common stock, or others that may seem best adapted for a basis, always making a selection of the best individuals of his herd for this purpose. By this means he will in a comparatively few years greatly improve his cattle, and bring them to twice their original value. We have known of dairymen more than doubling the product of their cows in this way. As previously stated, for many of the practical purposes, such as dairy products or beef, we have known individuals of the higher grades that were fully equal to the pure-bred animals, in quality and amount produced; but for breeding purposes, of course, a grade cannot be depended upon to reproduce the characteristics of a breed, since there is that constant tendency to revert to the original or unimproved type, which is seen in all animals and plants. Only pure-bred animals can be depended upon with any certainty for perpetuating the qualities that characterize them as an established breed.

What is true of breeds is likewise applicable to grades with respect to their adaptation to the wants of the farmer, the climate, soil, and other conditions. In the vicinity of large cities, where immense quantities of fresh milk are consumed, these breeds or their grades are most used for furnishing the supply which produce large quantities of milk, such as the Dutch, or the Ayrshires, the grade produced partaking more or less of the characteristics of the breed.



GRADE HEREFORD STEER, "CONQUEROR."

Winner of Sweepstakes for Two-Year-Olds, at Fat-Stock Show, Chicago, 1880. Property of T. L. Miller, Beecher, Ill.

In New England, the middle, and many of the northern states, as well as other dairying sections, the milk or dairy breeds and their grades predominate, the old style, or unimproved Short-Horn, forming in many cases the basis of the stock to be graded up or worked upon. In nearly all the more settled grazing regions of the country, the Short-Horns have for some time predominated, since their large size, fine, compact, and massive forms, early maturity, and the readiness with which they lay on fat, render them very profitable for the production of a superior quality of beef; but within a few years the merits of the Herefords for beef production have been more fully appreciated in this country, and they at present seem to be competing with the Short-Horns for the palm of excellence. Since the year of 1876 more especial pains have been taken towards improving the cattle of the great western plains, and large numbers of Short-Horn and Hereford bulls have been transported to those immense grazing regions that lie east of the Rocky Mountains, and the valleys that lie interspersed within them, for the purpose of producing grades for the great markets of this country and Europe.

Grade Short-Horns and Herefords have been known to attain a weight of 3,500 pounds live weight, and it is said that at the stock yards in Chicago it is not uncommon to find many that will average from 1,800 to 2,000 pounds.

The grade Hereford Steer "Conqueror," of which we give an illustration, weighed when twenty-seven months old 1,845 pounds. The weight of the grade Devon Steer, "Jim Lockwood," when three years and five months old was 1,649, having made an average daily gain from birth, of about one and one-fourth pounds.

Native Cattle.—The genus *Bos* cannot properly be said to be a native of America. The wild cattle of the vast plains of South America, Texas, Mexico, and other portions of this continent, do not owe their origin to this country, but are descended from cattle brought here by the early Spanish adventurers, some of which, escaping from domestication, became wild, and in time increased to such an extent that in South America innumerable numbers of them have been slain simply for their hides and tallow. The buffaloes seem to be the only original cattle of this country, and the so-called "native cattle" of the older settled portions, are the descendants of those brought over by the early colonists from time to time, as settlements were made. Our present native or common cattle are therefore a mixture of various breeds that have been imported at different times.

The early settlers, of course, took with them the cattle common at the points from which they sailed, and on arriving at this country, had too much to do in establishing for themselves a home in the wilderness, clearing the lands, and defending themselves from the Indians, to pay much attention to the breeding of their cattle. During the past century, more especially during the last half, greater attention has been paid to breeding cattle in this country than formerly, and crosses have been made with the improved types of the better breeds of Europe, especially England, that have greatly improved the common stock. It is probable that the first importations of cattle to this country were those taken to Virginia previous to 1609, although nothing definite is known respecting the exact date of their arrival. History states that several cows were taken to Virginia from the West Indies in 1610, and during the next year no less than one hundred arrived there from abroad. The earliest importation of cattle into New England was doubtless in 1624 by the Plymouth Colony. In 1631 they are mentioned in the old records at Plymouth, as having greatly increased. It seems that a division of these cattle took place in 1627, three years after their arrival here, one or two being described on the records as black, or black and white; others as brindle, which proves that there was no uniformity of color among them. Shortly afterward a large number of cattle were brought over from England for the settlers at Salem. In 1625 the first importation was made into New York from Holland, by the Dutch West India Company, and the foundation was then and there laid for a valuable race of animals, which have been greatly

improved by subsequent importation from that country and England. In 1627 cattle were brought to the settlement on the Delaware from Sweden, by the Swedish West India Company. In 1631, 1632, and 1633 a number of importations were made into New Hampshire by Capt. John Mason, who, with Gorges, procured the patent of extensive tracts of land in the vicinity of the Piscataqua River. These Danish cattle are described as large, coarse, and of a yellow color. Many of their descendants, mixed with other breeds, though often ungainly and ill-shaped, have been remarkably good milkers, especially as to quantity. It will thus be seen that the native stock is a mixture of all breeds and races. Laurence, in his interesting work entitled, "A General Treatise on Cattle, the Ox, Sheep, and Swine," published as long ago as 1805, gives the following list of English breeds of that time:

"These are the original or established species or breeds of cattle in Britain, with their permanent varieties, as they are found in the beginning of the nineteenth century: The Devons—from these have been derived the Hereford, Old Gloucester Reds, and Sussex; the Kentish Homebreds; the Welsh Mountain and Lowland cattle; Isle of Anglesey; the Lancashire, or Northwestern, and Midland County Long-horns; the Shropshire Wide-horns; the Northern Short-horns, or Teeswater, Lincoln, and Holderness, or Yorkshire Short-horns; the Northern Half-Long-horns; the Polled; the Norfolk Homebreds; the Suffolk Duns; the Scottish Island, Mountain, and Lowland cattle; the Wild cattle of England, the Alderney, and Irish cattle."

Which of these different breeds or races were first imported to this country, or predominated with the early settlers, is not definitely known, and will probably ever remain a matter of conjecture.

The Spanish types have been preserved in South America, and in all the country south of Texas. In the northern portion of the United States will now be found the better breeds and their grades, such as the Short-Horn, Hereford, Devon, Ayrshire, Dutch, Jersey, etc., the different breeds prevailing according to the locality. Although the common or native cattle of the country are of course very much inferior to breeds of pure blood, individuals will be occasionally found among them that possess qualities of superior value, and many of them are capable of great and rapid improvement. The following shows what may be accomplished with only the native stock, by care and judicious selection. In 1845 a man began dairy farming upon the Schohairiekill, in Greene County, New York. He was not a farmer, but, on the contrary, had been a tanner in the county for twenty years. Having cleared the land of its hemlock, he found it formed a fine sod; consequently when his tannery closed for lack of bark, he stocked his land with milch cows, and began to make butter. For ten years he followed the old beaten track, obtaining an average of about a hundred and twenty-five pounds of butter a year from each of his fifty cows. Then it occurred to him that this was not enough, and he proceeded systematically to improve his herd, keeping an exact account with each cow, and of his whole farming operations. He had only the "native" stock of the country. The record of the herd begins in 1856, and closes with 1863, keeping up the number of fifty cows, and breeding only for the dairy, from the best animals for this purpose that he could select from among them. The main point is not the amount produced, but the steady increase, under this management, of their average product year after year, as shown by the record:

Years.	1856.	1857.	1858.	1859.	1860.	1861.	1862.	1863.
Pounds butter per cow,	125	136	161	166	183	217	223	225

In commenting upon this case, a recent writer says: "In eight years this man had entirely changed his animals, although keeping the same stock, improving it by good management and without expense. The result was an increased product of a hundred pounds of butter a year to each cow, three-quarters of which he reckoned clear gain. It was a most common-sense, practical, business-like operation. Any farmer can do the like.

On a high bluff, overlooking the village of Prattsville and the farm where this work was done, the profile of Col. Zadock Pratt stands out in bold relief, cut on the solid rock,—a fitting monument to one of the first men who systematically undertook, in an inexpensive way, the improvement of the common milch stock of America, and left an authentic record of his doings as a guide and encouragement to others.

Some men feel satisfied, if, on keeping a record of the product of the whole herd, it shows a good annual average per cow. A very common mistake is made in dividing the gross product of the herd by the average number of cows in milk, instead of the whole number kept. It should be remembered that every cow has to be fed twelve months in the year, and every twelve months lessens her period of usefulness by a year; therefore what is wanted is not what the animal will yield while in milk, but what she produces during every calendar year.

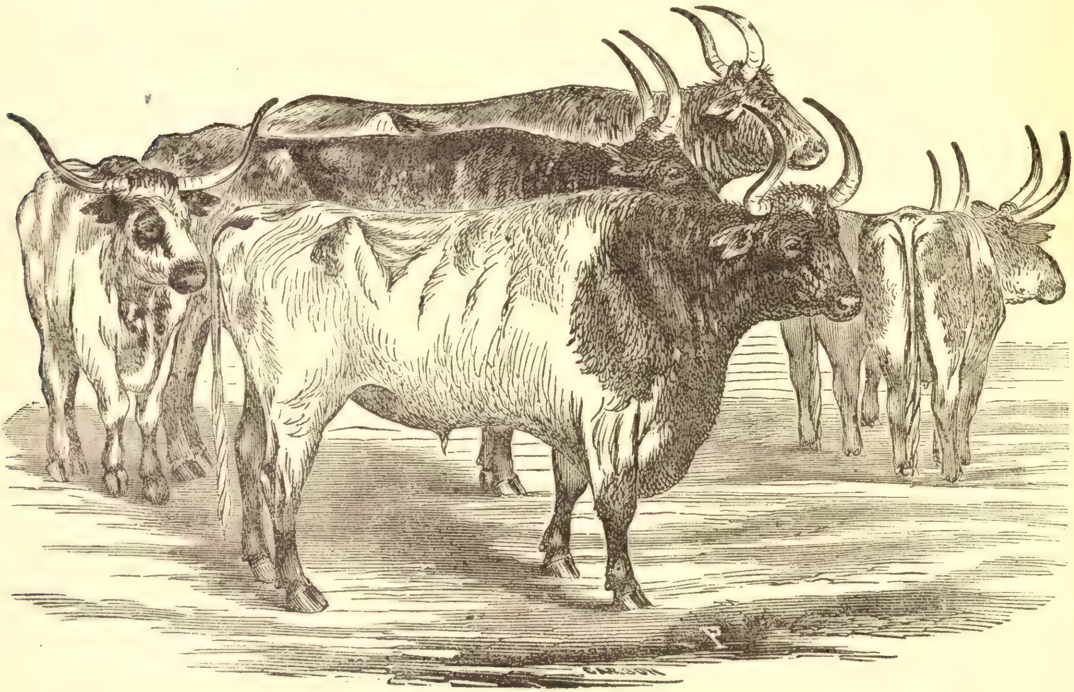
Still further: as to a record, milk-production alone is not sufficient; quality as well as quantity must be considered in the question of profit, especially if butter-making be the object. The only sure way is to test the milk of every cow separately, often enough to determine its butter-making capacity. For this purpose the cream-gauge is insufficient. There is no fixed relation between the percentage of cream from a certain cow's milk and the percentage of butter. Cows differ as much in their cream as in their milk. The weighed butter is the test. But if, by the record, you know how much milk a cow gives each month, and once a month ascertain how many pounds of her milk are required to make a pound of butter, you have a correct guide to the value of the animal."

If such results can be attained by skillful management with only the native stock, what may not be accomplished with the improved and valuable breeds that (especially for grading) are within the means of almost every farmer of the country. Here is certainly an example that speaks volumes of truth and encouragement in behalf of a systematic and judicious management in the breeding and care of cattle. By consulting various authorities it is found that in the year 1710 the average weight of Smithfield beef cattle was three hundred and seventy pounds; and in 1794 the average weight of cattle in the English market was four hundred and sixty-two pounds, this being an increase of twenty-five per cent. during the preceding thirty years. Very few animals were fatted at that period under five years of age, they being of slow growth and maturity. When we compare these with some of the present improved breeds, with respect to size, weight, rapidity of growth, maturity and quality of beef product, the manifest difference in favor of the latter is great and the improvements brought about by careful breeding and judicious management is truly wonderful.

Texan Cattle.—These cattle are of Spanish origin, and were introduced into Mexico (of which Texas was then a part) about the year 1500, being brought to this continent by the early adventurers. They are supposed to have been of the same race as those kept for many centuries by the Moors on the plains of Andalusia, and their successors, the Castilians, although we have no positive proof of this fact.

These cattle in time covered the vast grazing plains of Mexico, Texas, and California, becoming, to all appearances, wild cattle, feeding upon the abundant herbage the climate and soil of those regions afforded. Immense numbers of them have been killed annually until within a few years, simply for their hides and tallow, notwithstanding they had increased to the extent that within a few years their estimated number in Texas alone was over four millions, and at that time constituted about one-seventh of the cattle of the United States and territories. They congregate in large herds and range and propagate with little care, being known to their owners only by the marks or brands that are put upon them. They are gathered once a year for identification, when the calves are castrated and branded, while those fit for beef are selected and driven to market. They are impatient of restraint, and having led a wild, roving life, never become really domesticated. When from five to seven

years of age, they average about a thousand pounds live weight, but when fed on corn for some months they will reach an average of 1,200 pounds, with perhaps from 600 to 700 pounds of marketable beef, as weighed from the butcher's block. These cattle, of which the cut is a good illustration, are of almost every color ever represented in a bovine animal; they are tall, lank, and bony, with coarse heads and exceedingly long horns, flat-sided, swayed in the back, with high flanks, narrow hips and quarters, and long and coarse legs. As beef animals, they have a large amount of offal in proportion to their flesh. The cows give only sufficient milk for the nourishment of their offspring, and are nearly as large as the oxen.

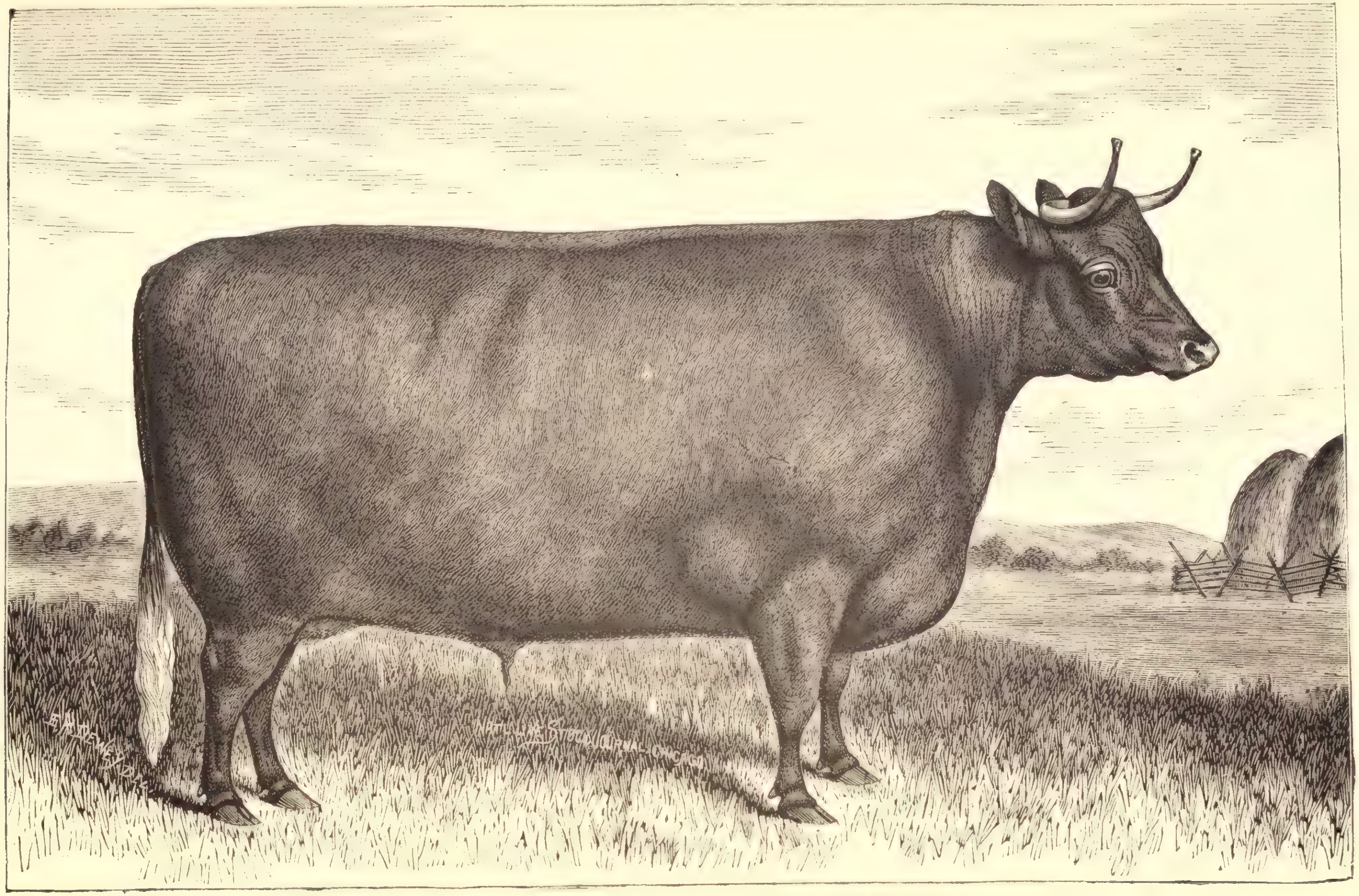


GROUP OF TEXAS CATTLE.

These cattle have aided much in supplying the beef markets of the country, but for a few years past the typical Texan steer has become less common in the Western stock yards, having been improved to a considerable extent by the importations of pure-bred bulls of the best beef breeds, such as the Short-horns and Herefords. The change brought about by this means is more and more apparent in the improved form, weight, fattening qualities, and early maturity of these half-wild animals that are now furnished for the beef markets.

By comparing the cut of Texan cattle, inserted above, with those of the fine pure-bred animals of the present time, we have a good illustration of what has been accomplished by the intelligent breeder, as well as a striking contrast between a poor and unprofitable animal and a valuable one, the breeding and keeping of which is a source of pleasure as well as profit to his owner.

Acclimation of Thoroughbred Cattle in Texas.—The introduction of thoroughbred cattle into Texas has been attended with a serious barrier in the form of the disease known by the various names of Texas, Spanish, gastric or acclimating fever. This is a malignant, contagious disease, originating in the lowlands of Texas and Mexico, and is said to resemble, in its effects on the system, the rinderpest of Asiatic Russia. It is, however, less destructive and contagious than the latter, since it will not be communicated to cattle



GRADE DEVON STEER, "JIM LOCKWOOD."
Prize Winner at Fat-Stock Show. Property of Gen. L. F. Ross, Avon, Ill.

from one pasture to another if they are kept separate. This disease is communicated by cattle traveling over the feeding grounds or roads that have been traversed by infected cattle, but it is destroyed by the first frost that occurs.

The best method of acclimating bulls in Texas that have been taken from the North, is to select the most healthy calves, those of stout, robust frames, and the offspring of dams and sires of strong constitution. Those dropped in the early spring are recommended as most suitable for transportation about the first of December, when the danger of the Texan fever is passed.

These should be fed liberally with milk until September, and then be allowed a suitable supply of wheat bran, crushed oats, corn leaves, grass or hay, with access at all times to plenty of pure water to drink. It is also well to have them made gentle by frequent handling, and broken to the halter, as they can by this means be so much more easily managed when they arrive at their destination. A writer in Texas gives the following directions in the *National Live Stock Journal* respecting the transportation and acclimation of calves thus imported:

"The cars for transportation should be well bedded, and food for the entire trip transported with the stock. Arrangements should also be made for a through trip when starting. Food, water, and careful watching by the herdsmen will land them at the place of disembarkation but little damaged by the trip. Care should be taken not to crowd too many in one car. Thirty head can be taken if they are properly cared for, yet twenty-five head would do much better. The calves designed for shipment in one car, if more than one is to be sent, should be permitted to run together for some time previous to starting. After reaching the terminus of their journey by rail, a week's rest, in dry lots, should be granted them, with the same kind of food as before shipment. When taken any distance, slow and easy travel should be given them. If either costiveness or its opposite is exhibited, simple remedies should be given to prevent the too active purging or relieve the constipation. The preparation for their reception at their Texas home should have been completed in advance of their arrival; and in addition to a supply of corn, oats, and wheat bran, as referred to above, pure running water and free access to a growing oats or barley patch, which should have been sowed in early autumn for their benefit, should be allowed. Suitable protection must be provided to guard them from the cold blasts of our 'northers;' giving also prompt attention to any symptoms of fever, as follows: when the animal is discovered ailing, one table-spoonful of powdered charcoal, one tea-spoonful of powdered ginger, and, in about one hour, one quart of marsh-mallow infusion—*i. e.*, boil the mallow in hot water until you obtain a strong decoction—and one quart of camomile tea. If marsh-mallows are not to be had, give large doses of saltpetre; and if the animal is not relieved after eight or ten hours, repeat the above. Give plenty of green food as the appetite returns. This treatment has been quite effective; fully 95 per cent. of cases thus treated have recovered. The symptoms, when taken, are restlessness, dull eyes, and moping movements, with an inclination for solitude, constant straining to make urine, and the little voided of bad odor, and red in color. The bowels are either very costive or much given to scouring.

The most important discovery I have yet made concerning the future of thoroughbred cattle in Texas, is this: they can, under proper restrictions, be imported and acclimated at not exceeding a loss of ten per cent. This can be accomplished by following the course that we here lay down.

If December and January are passed without fever, you can feel safe from its ravages until the rains of spring, followed by the heat of June, when the ticks and vermin menace them. Then avoid exposing them to either rain or sun, and destroy the vermin by a free use of coal oil and lard, using two parts of the latter to one of the former. If only spring calves are brought, there will be less of fever than if older animals were brought. Too

many who bring young stock to Texas stint and half starve them, thinking that to keep them in good growing condition increases the chances of disease. My observation teaches the reverse to be true. To secure a complete development of bone, flesh, growth, and early, profitable maturity, a calf must have generous treatment—plenty of nutritious food, good water, and kind treatment. I have heard men complain that Texas Short-Horns were not growthy and handsome, like those exhibited at Northern fairs. The reason for the dissimilarity was readily found, on investigation, to be that the one had excellent feeding and grooming, while the other, in addition to a long winter, starvation and acclimation, with a spring and summer with rain and hot sun, had his vitality almost destroyed by ticks, lice, and vermin. Cattle from the North cannot be acclimated unless generous food, comfortable quarters, and kind treatment are given to them during their first year in Texas; and unless this treatment be kept up, they are worthless when acclimated."

It is also recommended by the above authority that no animal should be transported to Texas for this purpose that is over eight months old, and an imported calf should not be used freely for breeding purposes, until he is at least twenty months old; by such judicious management he may be useful for many years.

What Constitutes a Good Bovine Animal.—In considering this subject, the objective point, or the use to which the animal is to be appropriated, should receive the first attention. It should be the aim of every breeder to rear the best cattle; by this we mean that it will be found the most profitable to rear such, that in their various points are best suited for the uses required of them, whether it be for the profitable production of beef, labor, or milk. What might be regarded as a good animal for beef, might not be as valuable for working purposes; while a good beef animal might also prove almost worthless in the dairy, and the reverse. There are also certain portions of the animal that are essential to its existence and welfare, but which economically considered, aside from this, are of but little value, and which in beef are regarded as waste or offal. If, for instance, the bones are large and coarse, or the head and horns are large in proportion to the size of the body, and ill-shaped, there will be a larger proportion of waste or offal than is necessary, and accordingly a smaller proportion of what is really valuable, while at the same time such an animal will require more food than one of small, fine-textured bones, and good points generally, since it is a fact known to every farmer that it requires a larger proportionate amount of food to make this offal, than it does to produce either flesh or milk. It will require nearly double the quantity of food to fatten a lank, tall, coarse-boned ox, than a finely formed, well-bred animal of the same weight. We know of a western farmer, who a few years since tried the experiment of fattening about 500 Texan steers by stall feeding, having previously prepared stables for the purpose, which had water conducted to them in pipes, with equal facilities for conveying grain and hay. The animals, being semi-wild, were pulled into the stables with lariats, tied to the stanchions, and remained there until fat, which was five months. Every means was used to keep them quiet, the stables being kept partially darkened and no strangers ever admitted.

Although these animals fattened very well, and brought a good price for beef in the New York market, the experiment was never repeated, for, to use the farmer's words,—"the larger price required for good grade Short-Horns would yield a better profit for the feed consumed." Had this man better understood the laws which govern the animal economy, as well as proper sanitary laws, we doubt whether he would ever have attempted such an experiment when better and more profitable stock were attainable, or have confined 500 steers in partially darkened stables for five successive months, without permitting them the exercise of vacating their stables, once during that time. Coarse animals are always large feeders in proportion to their weight, and for any purpose whatever such animals are to be avoided.

When beef production is the object, the massive, compact, block-shaped body, with fine bone, is best suited to the purpose; one so formed as to admit of the laying on of the greatest amount of flesh in those parts that furnish the most desirable cuts at the butcher's block, and with the least possible amount of offal. A narrow-chested, gaunt, large-boned animal will require a longer time and a greater amount of food in proportion to his weight to be ready for the shambles than the latter, and when ready, cannot possibly furnish as much meat in proportion to his size and weight, or of as good quality.

The Hereford, Short-Horn, and Devons are probably the best types of beef breeds that could be mentioned, their carcasses when well fattened furnishing the largest proportion of good beef, compared with their live weight, or the least amount of offal. If working oxen are desired, a form compatible with strength, endurance, and activity, suited to the purpose, should be selected. A working ox should have considerable breadth to give sinewy power; he should also have large lungs, and sufficient room for their expansion to give him sufficient wind for the hard work he will be called upon to perform. A dairy cow should have a well-developed frame, and such as will admit of room for the healthful and active exercise of the organs of digestion and secretion. Her milk veins should be large and prominent, her udder capacious and set well forward, while she should be able to assimilate her food into an abundant supply of milk, and keep in good flesh.

She should possess all the characteristics which are the well-developed external marks of good milkers, and which very rarely, if ever, disappoint, the practiced eye or skillful hand. Thus it will be seen that qualities that would be considered the highest possible degree of excellence in one breed or class of animals, might not be desired in another, but that each are to be judged by their utility for the purpose designed. Beauty of form and color should not be entirely ignored in cattle, but should always be secondary to utility; yet perfection of form, as we have seen, must differ very essentially in different breeds of animals, and it should be the aim of the breeder to attain the highest degree of excellence possible according to its respective kind.

What Breeds to Keep.—From the description of the many different breeds of cattle previously given, it will readily be seen that no single breed would be found superior to all others for all purposes and localities, embracing as our country does, such a variety of soil and climate. Before selecting a breed, the first consideration should be,—as previously stated,—its adaptation to the use to which it is to be appropriated, and second, its adaptation to the locality in which it is to be placed. The breed most profitable for the farmer who makes beef a specialty would in all probability prove the least profitable for the dairy; and the cow that would produce milk richest in the butter element, might not prove the most remunerative to the farmer for selling milk, unless an extra price was paid on account of its superior quality. The breed that would be the most profitable for the Western grazier, or the Kentucky farmer, might not be the best for the farmer in some portions of New England.

The choicest beef breeds should never be chosen for the dairy, and a large heavy feeding breed should not be selected for regions where pastures are scanty, especially if pasturing is practiced in summer, instead of soiling. The character and condition of the pastures in which the animals are to be kept in summer, and the quality of food they are to be supplied with in winter, will also require consideration in the choice of a breed. The farmer whose object is to sell large quantities of milk at the common price should select the largest milkers, while the farmer who aims to make the best butter and in large quantities, should select a breed that produces the richest milk. There are localities where the rich soil produces an abundance of the best grasses, with plenty of pure water and a mild climate. In a region of this kind any of the imported breeds would do exceedingly well; but there are other sections where the soil, climate, and conditions are such that a choice with reference to special adaptation would be necessary in order to reach the best results.

The large breeds, such as the Short-Horns, Herefords, and Dutch, are better adapted to rich, level, or rolling lands with an abundance of grasses, while the Jersey, Guernsey, Devon, Galloway, and Alderney would be better fitted than the former for localities where the pastures are hilly and less luxuriant. The principal characteristics of the beef and dairy breeds of cattle have already received so much attention in previous pages as to render it unnecessary to compare their respective merits in this connection; suffice it to state that in making a choice of breeds adapted to his locality, the farmer should be careful to select the one best adapted to the locality and conditions, and the special use to which it is to be put.

Cattle One Should Never Buy, can more easily be described than a selection made as "the best" breed, among the excellent beef and dairy breeds that we have at present to select from, each possessing especial valuable qualities. Allen has given a good pen-picture of the kind of cattle to be avoided, thus:

"A big-headed, narrow-chested, flat-ribbed, hollow-backed, narrow-hipped, and droop-tailed ox is a poor worker, and such a cow, if she be not a poor milker, is seldom a profitable one, for both ox and cow are huge feeders. The ox has no room in his narrow chest for full lungs to play. Therefore he is short-winded. His flat ribs and narrow hips allow him but a small development of muscular power. His strength is therefore contracted. His anatomy being sacrificed in breadth and depth, he has no *place* to lay on flesh as a beef animal, and he is worthless, comparatively, for any purpose. So with the cow; if she take flesh poorly, she gives a less quantity of milk; but if she do happen to milk well, it is because her food is chiefly thrown into the secretions of her milk veins, which happen, in such instances, to be extraordinarily developed. We have seen such, but they were the exceptions, not the rule, and all such cattle are to be avoided. There is no profit in them, any way; as a calf, the butcher does not want him, except at a reduced price; as a steer, the grazier jews down his price; as a working ox, nobody wants him, except he can get him "cheap;" as a fat bullock — if he ever can be fatted — the butcher "blows" on him; and as for the consumer — he is to be pitied. Soups, and dried beef — and poor at that — is all that he is fit for. He is a drag on every one's hands unfortunate enough to own him, from birth to slaughter. And so with the cow; poor in every quality, she goes through a miserable life, an object of contempt, and ill-usage throughout, simply because her breeder did not veal her at six weeks old, for she has never been good for anything in the hands of anybody since, and has taken the place of a better creature, which might have been profitable in every condition of her life, and a pleasure to every owner."

Such an animal as above described will not only prove unprofitable to the owner in the returns of beef or milk, but will consume nearly twice the amount of food that would have been required to maintain in good condition a really fine and valuable animal. Coarse-boned animals will invariably be found to be gross feeders, according to their weight, and will give the least for the food consumed.

The Breeding of Cattle. — The progress in agricultural advancement in any country or period of its history, is marked quite as much by the improvement of its domestic animals, as by the general methods of agricultural practice, the implements employed, and the skill with which they are utilized, etc. In none of the animals domesticated by man, is there manifest a more striking display of the breeder's skill, than in some of the improved breeds of cattle of the present time. The raising of cattle for dairy use or beef production has become such an important industry in this country, that the attention of farmers generally is being directed more than formerly to the necessity of keeping better stock than the native or common class of animals furnish, and the proper means are being employed more extensively towards the accomplishment of this object, by disposing of inferior animals, and substituting better breeds in their places, or by improving what they may have by judicious crossing with pure bred animals.

Many farmers, however, still make no attempt at improvement, because they have the mistaken idea that they must procure a thoroughbred breed in order to receive any great benefit by the change;, this being beyond their means, they continue in the former way, and receive but small profit as the result. Others entertain a prejudice against blooded stock, and are under the impression that its superiority consists only in the possession of a pedigree. This is also erroneous, for thoroughbred animals have a value of their own, consisting of the many good qualities which they have inherited from their progenitors, and the power which they possess, called in breeders' phrase, "prepotency," of transmitting these good qualities and characteristics to their offspring, while pedigree is simply valuable as a kind of certificate of pure breeding.

Pure bred stock has a money value which is being more and more appreciated by the intelligent breeders and farmers of our time, for it has been tested and found of superior worth. The first and principal object of the farmer is to obtain the largest profit in return for his expenditure in money and labor, and this cannot be secured in the raising of cattle, or any other stock, unless he keeps such as will bring the largest profit on the outlay. It costs just as much, and requires just as much time and attention to keep inferior cattle as those of the best quality, and since thoroughbreds and their grades do yield larger returns in beef and dairy products than the native stock, it follows as a logical conclusion that they must be the most profitable for the farmer to keep.

How to Improve Farm Stock. — If a farmer cannot afford to substitute at once his common herd of natives for pure bred animals, — and but comparatively few farmers of the country have sufficient means to find it for their highest interest to do so, — he may do the next best thing, and the only one under the circumstances that seems practicable for him to do, and that is, to improve his stock, whether for beef or dairy purpose, by the use of a thoroughbred bull of the breed best suited to his requirements, and grade up, reserving such of the offspring for future progenitors as possess the best characteristics of the breed. By this means he would soon make a great improvement, which would be constantly progressing.

Some of the best grade beef animals are fully equal in the product they furnish, to the best pure-blooded beef breeds; while many of the high grades of the choicest dairy breeds produced by crossing with the best common cows have been known to nearly, if not fully, equal the thoroughbreds. Individuals of this herd will of course differ in this respect, and when breeding for dairy purposes those which possess the dairy characteristics most prominently should be selected. But for breeding purposes, a thoroughbred bull of the best quality should be selected. Farmers should carefully avoid using a grade for this purpose, a mistake too commonly made, with usually disappointment for the result. Although a grade bull may be really a fine animal to all appearances, he cannot be depended upon for transmitting his characteristics to his offspring, and would be quite as apt to perpetuate the bad qualities of his ancestors as his own good ones. On the other hand, some farmers make the mistake of placing too much reliance on the pedigree of the animal, and consider that because a bull is pure bred, although he may be defective, — as occasionally we find animals in the best breeds, — he will transmit the good qualities of his progenitors rather than the inferior ones of his own. This is not a safe course to follow, and would probably lead to disastrous consequences.

The best bulls of the best breeds should be selected, and when these are used with dams of a breed of the same quality, it is a rare thing to meet with failure; the usual result will be a calf having the good qualities so strongly impressed upon it as to be able to transmit them with almost absolute certainty. A calf from a good native cow sired by a thoroughbred bull would be very liable to inherit many of the good qualities of the sire, while it might at the same time have the good qualities of the dam strongly impressed upon it, but it would be also nearly as liable to inherit her bad qualities or those of her ancestors.

The question might then be asked, wherefore the necessity of selection, in such a case, if the offspring would be liable to inherit the bad qualities of the dam or her ancestors? In reply we say the nearer we can approach perfection in the animal, the more liable are these fine qualities to be transmitted, providing there is a fixed habit of transmitting these qualities firmly established in the breed, by a long line of hereditary descent. For this reason, as previously explained, when both parents are pure bred animals we can predict the character of the progeny with almost certainty, but if the sire only is pure bred, the better the dam, the more possibility is there of the offspring being a good animal, than if the dam was inferior, since we believe the dam has nearly if not wholly as much influence in determining the character of the progeny as the sire, and it is always safest to run as little risk as possible, and select the best native cows in such cases.

The bull designed to get dairy stock should possess the characteristics which in the cow are indicative of fine dairy qualities, large hind-quarters, large and well-developed veins and escutcheon, fineness of form, mellow skin, etc. He should also be descended from the best dairy stock, and his dam be a good milker. For further discussion of the subject of breeding, we refer the reader to BREEDS AND THE PRINCIPLES OF BREEDING, in another department of this work.

Although much depends upon the breed with regard to the profits resulting from the rearing of cattle for any purpose, yet it is equally certain that stock of the best quality of its kind, whether native, grade, or thoroughbreds, will be sure to deteriorate, and become unprofitable by neglect and lack of proper attention.

We would impress it upon the minds of all farmers, that the most profit as well as pleasure consists in keeping good stock and in giving it equally good care, consisting of a liberal amount of food of suitable quality, an abundance of pure water, shelter from storms, the heat of summer, and cold of winter, according to the temperature and climate, also pure air when confined in stalls. Precaution should be taken to prevent interference with improvement in cattle by "scrub-bulls," whose progeny is not worth the raising. Such creatures are a nuisance to their owners and all adjoining neighbors, and by being permitted on the highway, or from breaking into enclosures, have been the means of doing much harm in this respect. Such animals are only fit for the butcher's block.

Early Breeding of Heifers.—Some breeds of cattle arrive at maturity considerably earlier than others. By breeding as early as practicable, without injury, much valuable time is saved, and the animal thus made more useful during her life, while it is found that there is no perceptible difference between the calves thus produced, and those of older cows. To farmers who are anxious to improve their stock in the shortest possible time, early breeding of their heifers is a great advantage. Early stimulating the secretions of milk in the growing heifer has a tendency to increase the milking propensity through life, while she is also more docile and may be handled more easily. If a heifer is bred from before her physical system is sufficiently developed and matured, it will have a tendency to check her growth and prove a positive injury. Much depends upon the condition of the animal, and the treatment she has previously received. Animals that are well fed and cared for from birth will develop much more rapidly than those that have been neglected and ill-fed. No heifer of any breed should drop her calf when much under two years of age. When two years or twenty-seven months may be safely taken as a general rule of practice, instead of three years, as in some cases a year is gained in the profit of the animal for dairy use. Most of the western ranchmen permit nature to take its own course in this respect in their herds, and the cows generally drop their calves at about the age of two years. There are well-authenticated instances of heifers calving at fourteen or fifteen months of age, and even younger.

A Mr. Eldridge Davis, living near Cambridge, Ill., owned a grade Short-horn heifer a few years since, raised by himself, that dropped a strong, lively heifer calf at the age of

eleven and a half months. Such instances are, however, exceedingly rare, and may be regarded as a misfortune. A period of less than twenty-two months or two years of age is not to be desired, and with slow maturing breeds a longer period is to be preferred.

Drying off Cows.—The length of time in which a cow should go dry before calving will depend much upon her milking qualities. Those cows that produce a large amount will generally hold out longer than those giving less, although there are some exceptions. Some cows will give a very large yield for four or five months after calving, and then gradually lessen the quantity until they are nearly dry, three or four months before dropping the calf; others give a good quantity of milk up to nearly the time of calving, and a few will yield it up to the very time. Usually cows will gradually diminish the quantity of milk yield, and no especial efforts will be required to stop the flow.

It is better for both the cow and her calf, as a general practice, that she should not be milked for at least six weeks before calving, and many farmers prefer to have the time extended to two months or more. The calf will be better developed and larger, and the yield of milk will be greater the ensuing season and hold out better under such conditions, than if the cow was milked up to the time of calving.

There are occasional exceptions, however, and it sometimes happens that, in cases where the milking qualities are very fully developed, it is difficult to dry a cow sufficiently to make it judicious to cease milking her much before the time of calving. The quality of food given at such times will largely influence the secretion of milk, and when the task of drying the cow seems a difficult one, avoid feeding roots much for a time, or other food that has a tendency to increase the flow of milk. In drying a cow the milk should be drawn at irregular intervals. The practice with some is to take but a part of the milk at a time, but this is not be recommended, since the milk that remains in the udder is liable to become thick, and finally lead to inflammation and other serious consequences. The period between the milkings should be gradually lengthened, never regular, until the object is accomplished; but at each milking it should be thoroughly performed. After the cow is supposed to be dry, the udder should be frequently examined, as milk will occasionally, under such circumstances, be secreted in small quantities, and should be drawn.

General Treatment of Breeding and Milch Cows.—All breeding and milch cows should be treated with the greatest kindness and gentleness. They should never be hurried in driving, or jumped over fences or bars. They should never be worried by dogs, or forced to approach anything that they regard with fear. Never permit them to be shouted at, or receive a blow for any cause. Be gentle with them always, and never allow a man or boy on the farm who violates these rules.

Unkind treatment will frequently cause a cow to withhold her milk, a habit that will soon greatly injure her milking qualities, while harsh treatment to a pregnant cow will frequently cause abortion, which is a serious evil, for such results are very liable to recur again.

A cow in milk may be greatly injured, if not made valueless, by a thoughtless or cruel herder, or brutal milker; hence the importance of observing the directions previously given. It is found that cows are in heat once in about twenty days; hence, after being served, if the heat does not recur in that length of time, it is to be presumed that she is pregnant; and such, with rare exceptions, will be the case. Within three or four months, if she remain quiet, proof of her pregnancy may be ascertained by gentle pressure of the hand on the right flank. The beating of the fœtal heart may also be noted at three to four months by placing the ear close upon and touching the right flank. The udder also will have increased in size.

The food should be sweet and nutritious, given often, and in sufficient quantities to appease hunger. The main point in feeding is to keep the animal in a healthy and thrifty

condition, and not permit her to lose flesh; on the contrary, it would be better to have her gain flesh during this period. With this object in view a change and variety of food is important. It must be remembered that the food she eats must not only supply nourishment to her own physical system, but to that of her offspring also, and hence there is an extra demand for the material. A calf at birth usually weighs from 75 to 80 pounds, and some of the large breeds, such as the Herefords and Short-Horns, even considerably more than this; and it requires at least fully as much food to produce such a calf, as to put seventy-five pounds of flesh in her own body. Oats are excellent food for cows when dry, being rich in muscle-forming material. Corn meal alone is not suitable food for cows at such times, but may be fed with clover hay. Two quarts of corn meal and one quart of oil meal per day is also very good. Roots, such as potatoes, turnips, carrots, mangold wurzels, etc., fed in moderate quantities, may also be given. Care should be exercised, however, not to give food that is too rich or stimulating for a week or two before calving, or to permit the cow to fill herself with coarse hay or other equally distending food about the time of this event, as it might be followed with ill consequences.

As the time of maternity approaches, the udder must be closely watched that inflammation may not ensue, and this becomes all the more necessary with heifers about to bring their first calf. Should the udder seem too full of milk, it will be necessary to draw from the teats from one to several quarts. We have known of instances, where, in the abundance of succulent grasses of May or June, it was necessary to draw the milk for several days before calving in order to prevent serious inflammation of the udder. We are aware that some object to this, as injurious to both dam and calf, but in cases where it seemed necessary by the unusual distention of the udder, we have never known any results but the most satisfactory to follow such a course. The drawing of the milk should be done regularly, however, and never at irregular intervals.

Care at Time of Calving.—The common duration of pregnancy in cows is 284 days. As the time of calving approaches, the cow should be removed from the rest of the herd to a box-stall or comfortable shed, and be supplied with an abundance of good clean bedding. Here she should remain undisturbed, being supplied regularly with food and drink. In the majority of cases the parturition will be natural and take care of itself, and the less the cow is meddled with, the better. Nature usually does her work well, and needs no interference from man. But there are exceptions, and for this reason it is well that she should be watched in order to see that no difficulty occurs that may require immediate attention. Do not however disturb her by too constant watching. The natural presentation of the foetus is with the head lying upon the fore legs, any deviation from this being unnatural and liable to be attended with difficulty. With the natural position, nature will usually require no aid. Whether the cow should be permitted to eat the "after birth" is a question upon which intelligent breeders seem to entertain different opinions.

It appears to be natural for some animals to do this, and that fact might of itself be an argument in favor of permitting them to do so, disgusting as the practice may seem. We can, however, see no reason why following this natural instinct could in any way benefit the animal, on the contrary, it to all appearance would be an injury to have such a bulky mass of indigestible matter in the stomach, but we have never known evil results to attend either course.

If there is any difficulty in parturition by a wrong presentation of the foetus, a good veterinarian should be employed if possible. By such timely and skillful assistance, the life of both the calf and the dam may be saved. Never employ an ignorant, brutal man who would resort to violent means in such cases. False presentations are varied, though rare; the most common is that of the head first, with the legs doubled under the body. In all such cases the right hand should be well smeared with sweet oil or fresh lard, and carefully

introduced, and the position changed to the natural one, if possible. Assistance may be given when the natural throes are repeated, but cruel violence should be avoided. When the nostril of the calf has protruded, and the position is found to be unnatural, the head cannot be pushed back without destroying the life of the calf.

After calving, the cow should be given as soon as possible, a warm bran-mash. If she has not already been relieved of the after-birth, this will have a tendency to produce its easy separation. If there seems to be difficulty in this respect, a dose of four ounces of salts mixed with two ounces of ginger may be given after about eight hours. Sometimes a pint of flax-seed boiled and given in thin gruel will loosen a retained placenta. A pint of oil meal in thin gruel given every day for a week before calving will usually prevent any difficulty of this kind.

If, however, every means employed prove ineffectual in its removal after twenty-four hours have elapsed, there will be a necessity of securing its separation, and removal by other

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means. The right hand and arm should be greased with fresh lard, and carefully introduced into the womb. With the thumb and fingers the various connections of the membrane may be separated, and it can be removed from the body. Considerable time should be allowed for doing this, and all violence avoided. Many valuable cows have been lost through the brutal treatment of ignorant persons at such times. Avoid giving very cold water for several days to a cow after calving. She will be quite thirsty, and should have water given her frequently in moderate quantities, but it should be warmed just enough to take off the chill. Milk fever is sometimes caused by a neglect of this precaution. She should also be protected from cold and storms. For a week after calving it will be well to feed a cow moderately, giving at the same time some laxative food, such as flax-seed gruel and warm bran mash.

Care of Calves.—The best time for calves to be dropped is in the spring. This seems to be Nature's time for the commencement of the young life of most animals, and no better one could be chosen. The calf will generally be able to stand immediately after birth, and to suckle the dam without any assistance; but sometimes, owing to weakness, it

will need to be held to the cow to get its first meal, which should be done as soon as practicable, since the milk of the dam will strengthen it, and bring the stomach and bowels into healthy action, enabling them to discharge the foetal nutriment they always contain at birth. Whatever use is to be made of the calf, many consider it the best practice to allow it to remain with the cow for about three days, permitting it to draw all the milk it wants during that time, the milk remaining in the udder to be taken by hand twice a day at the usual time of milking. Neglect in this latter respect might greatly injure the cow for milking purposes, as for instance, if she gives more milk than the calf can take, and a portion is left to produce inflammation in the udder. Besides, the milk of the cow will not be fit for use until after the expiration of at least three days, and if the udder should be inflamed and hardened, nothing will so soften and reduce the inflammation as this natural method of its being drawn by the calf.

Another practice preferred by others, is to separate the calf at once from the cow, not permitting it to suckle the dam at all, except where there is a hard and swollen condition of the udder. In such cases the calf is taken after birth to a warm, dry place, out of sight and hearing of the dam, where it is rubbed dry, and when able to stand, is fed with new milk warm from the cow, which is given it regularly three or four times a day for the first two weeks. When not direct from the cow, it should be warmed. The advocates of this practice claim that it prevents the cow from becoming strongly attached to the calf as it would by having it remain with her any length of time, after which its removal would cause her to fret and mourn for it to the extent of causing her to withhold her milk.

This method is practiced in Holland. It seems to us that, all things considered, it is better, and attended with less care and labor to the farmer, to permit the calf to remain with the dam, at least, for the first twenty-four hours after birth, leaving them as quietly to themselves as possible. Where the udder of the cow is considerably distended, it may be best to milk the cow at once after calving, but where this is not the case, we should allow the calf, if he is strong and able to draw the milk, to reduce it first.

Calves for Veal.—When the calf is designed for veal, he should have all the milk that he will take direct from the cow, by having access to her at morning and night. He should be fastened with a strap about the neck with three or four feet of rope, and confined to a limited space away from the cow, at other times, where he will have plenty of pure air, and clean bedding. The flesh of calves confined in foul stables is unfit for food, it not only being unhealthy, by the blood of the animal being poisoned by breathing such air, but the flesh will be tainted with it. The milk of the dam, and an abundance of it, is required to make the best veal. Sometimes oatmeal, cooked or raw, cooked corn meal, or oil meal is fed besides, in small quantities. In such cases the quantity should be very small at first, and gradually increased.

Rearing by Hand.—When a calf is to be raised, it should be separated from the cow on the second or third day, or sooner if deemed desirable, and tied in a comfortable stall out of her sight. A strap should be fastened about his neck in such a manner that his pulling upon it will not cause it to tighten and choke him. He should have sufficient play to his rope to permit him to change his position, exercise a little, and lie down comfortably; from three to four feet will be sufficient. Give him plenty of nice bedding, and keep his stall clean. He should be taught to drink by bringing his muzzle down to the milk in a pail or trough, and be permitted to suck the fingers at first. After feeding in this manner a few times, he will soon learn to drink, although some calves will learn more readily than others. He should be fed with new, warm milk three times a day for the first two weeks, in sufficient quantity to satisfy hunger. Feed regularly and liberally, although do not go to the extreme of gorging.

It is too often the case that young animals are stinted in their food and their growth thus stunted from birth. In raising animals, quite as much depends upon the amount and quality of food given, as in the breed itself. The animal system cannot develop and build up unless it has the material to build up with, and this càn only be supplied through the food. New milk is thought by some dairymen to be too expensive to feed for a long time to calves, and it may be gradually substituted by warmed skimmed milk, but of course the new milk is better for the calf, being more nutritious, and it should have such food for at least three weeks. After this period new milk may be given in part, if desired, and the warm skimmed milk added. Oat or barley meal made into a gruel by being thoroughly cooked may also be given in small quantities at first, gradually increasing the rations. Coarse corn meal should never be given to young calves, and never raw. Fine corn meal, well cooked, may be fed to advantage. Oil meal is thought by many to be very good for this purpose. Flaxseed boiled for several hours until it is of the consistency of jelly, is also good for this purpose. These when fed should always be mixed with the milk.

If the weather is sufficiently warm, after a while it will be well to allow the calf to remain during pleasant days in a small yard where there is green grass. It will soon learn to nibble the grass, and drink water; besides all animals thrive better to be allowed the sunshine a portion of the time. At night, and on cold or stormy days, the calf should be kept in a warm stable. Calves, and all young animals, should always have access to a plentiful supply of pure water. Calves will also early learn to eat nice rowen hay. A little salt should also be given them as often as once a week, either in their food or in a separate trough. The longer the milk and meal rations are continued, the better for the calf. Liberal feeding of this kind continued through the summer, will well repay in the superior quality of the animal thus produced.

Successful cattle feeding begins with calf feeding, while neglected calves will scarcely ever grow into profitable beeves or valuable dairy cows. Any check in the growth of a calf from its birth, is a loss to the owner, as it will require a larger amount of food to counteract it, besides a loss of time; and the skillful feeder, understanding this, strives to *keep up a constant growth* of his calves by liberal feeding and a proper development of the digestive powers. Calves and all young animals should always receive kind and gentle treatment. They should be frequently handled, and in this way made docile, a lesson that they will never forget, while at the same time harsh tones and rough treatment will be equally well remembered, and their effects be correspondingly detrimental. A heifer or steer that has been made wild and timid by rough treatment, although a really fine animal, can never be of as much value to the owner as one that is docile and has never learned to fear man.

Fall and Winter Care of Calves. — A small ration of grain, such as oats or wheat middlings and oats, is highly beneficial to calves all through the fall and winter. Beginning in August with a pint a day, they will soon eat two quarts per day, and the growth will be steady. English breeders use linseed oil cake or oil meal quite extensively, one pint a day being given to each calf until the milk supply is wholly withdrawn, when a quart of oil meal and middlings mixed is fed. Corn should never be given as a principal food to young animals, since the albuminoids and phosphates are in too small proportion in corn to produce a full and complete development of muscles and bones. It also has an unpleasant effect upon the stomach and bowels of calves, being difficult of digestion as well as too laxative. The following by a prominent Western breeder gives such excellent advice on the winter care of calves, that we give it insertion.

"The first winter is a trying time for calves. Some, who mean to be judicious feeders, think the calf needs to be toughened the first winter, so that he may not become too delicate, and may have a healthy, strong constitution. So the calf is often required to dig for its grass under the snow, pick at straw stacks, or run in a stalk field, exposed in the most inclement

weather with insufficient nutriment. If this is a good way for the young animal, why not apply the same practice, comparatively, to our children? If scanty nourishment and exposure strengthens the constitution, why not carry out the principle where it will have a still more beneficial result?

The result of this most pernicious practice is too often seen in thin, unsteady-gaited calves in spring, whose constitutions have been thus strengthened (?) to the last degree of tenuity. Such thin animals are supposed to gain faster on the sweet early grass of spring; whereas they will require two months to regain their plump full weight, and two months more to reach the point they should have attained at the coming of spring grass. It is a most important point that the calf should never lose the thrift it possessed as a sucking calf — or, as it is sometimes expressed, should never lose its 'calf-flesh.' When the calf is to be grown for beef, this view would seem to be too clear to require argument. The shorter the time required for the animal to reach the market weight of 1,300 to 1,600 lbs., the greater must be the profit upon its market value. Every period of slow or defective growth is a clear loss in feeding. All the food consumed during these periods is thrown away, as compared with a system of feedign which aims at a constant progress in growth and ripening from the first day of life to market maturity.

The assimilation of the calf is excellent when receiving the milk of the dam, whether this is new milk or skimmed milk. The secretions of the system are then in the most active state, and it is of the utmost importance that this active growing habit should be kept up; and to do this the food must be appropriate and sufficient for all the wants of the system. The digestion of the healthy calf is strong and active, and it is not difficult to continue this rapid growth through the winter, if a full ration is supplied. If the calves are exposed to the lowest temperature of the season, they must be fed extra food to counteract the effects of such exposure. It is difficult to keep up the full rate of growth, under such circumstances, in the coldest weather.

We regard it as very bad economy to winter calves in the open air where the temperature goes very low. It is true that the best feeding may bring them through in respectable condition even there, but the expense is greater than the cost of shelter. Calves may be made comfortable in the West, where barns are scarce, under sheds covered overhead and on the sides with bundles of corn stalks properly fastened, or with straw or prairie grass. Such sheds will very thoroughly break all wind, and make a warmer shelter than a loosely boarded barn.

The calf should have the most nutritious food to carry it through the first winter. Farmers would find it most profitable to provide early cut grass, nicely cured, or a second cutting of grass or rowen for their calves. This hay, only second to good grass, will be eaten with a good appetite, and, with a small grain ration, will cause calves to grow rapidly through the first winter. Clover, cut just before blossoming, is an excellent food for calves. It has a larger percentage of muscle-forming food at this early stage of growth, and is also more palatable. But it is quite unprofitable to winter calves upon poor hay, straw, and corn fodder. If such coarse fodder is the best the feeder has, he may still bring his calves through in fine condition by feeding a proper grain ration. With such poor fodder the best addition is one quart of oil-meal, and two quarts of oats and corn, ground together. These three quarts, mixed and given in two feeds, make a day's ration to each calf. Oats may oe fed unground, and are well digested by calves. We have found calves to digest unground corn much better than older cattle. Linseed oil meal has a most salutary effect upon the health of the calf, keeping its digestive organs in excellent condition—having, in fact, the same apparent effect upon the stomach as tender grass. If the feeder cannot get oil-meal conveniently, then a good combination is one-third each of corn, oats, and wheat bran, the two former being ground—four pounds of the mixture for a day's feed.

If the grain ration has not been given during the early part of the winter, so much the more reason for feeding through March and April, quite up to good pasture. Feeding them well through these months will greatly improve them, and cause a better growth through the summer. This grain ration will prepare them for the change to grass. When animals are poor, and fed wholly on poor, dry fodder, the change to grass is very violent, and often produces scouring; but from a richer ration of grain to the sappy grass, the change will be agreeable, and they will put on weight rapidly."

Calves should be kept by themselves for the first year at least, and not be confined in an enclosure with full grown cattle. Young stock are not unfrequently hooked and otherwise injured by allowing the entire herd to run together.

Castration.—This is a cruel and painful operation, and should be performed as humanely as possible by the use of chloroform. Those male calves which it is not desirable to keep for breeding purposes should be castrated when two or three months old. It should never be delayed until they reach the age of six months. The conditions attending this operation in cattle, aside from the age when it should be performed, are essentially the same as for the horse, the directions for which will be found in the Horse department of this work (Vol. I., page 756, which see).

Spaying.—This operation consists of removing the ovaries of the female, and corresponds to castration of the male. It is generally performed for the purpose of fattening, as such cows will fatten more readily and make very fine beef. Spaying also prolongs the full flow of milk, when performed at the proper time and manner.

Such cows have been known to continue in milk for years. Spaying is, however, a cruel practice, and attended with considerable risk, and is not to be generally recommended. It is a delicate operation and should never be attempted by an unskilled person. Spayed cows are not as generally useful as those that have not been operated upon, and tend, in some cases, to the laying on of too much fat. We give no description of the process of spaying, as it is a difficult and delicate operation, and should be seen as performed by a skillful person, in order to understand it sufficiently well for successful practice.

Animals that are to be operated upon should be fed lightly for a day or two previous, and given bran mashes a few days afterward. Peritonitis is quite liable to set in, unless the operation is performed with the greatest skill and care, and even under such circumstances there will be an occasional loss from this disease.

Care of Bulls.—In order to be well fitted for stock purposes, the bull should be well fed from the time of his birth. The aim of the breeder should be to keep up a steady growth of the animal to maturity, without making him over-fat or forcing his growth; for while it is a very injurious practice to stunt the growth of such stock with insufficient food, or that of a poor quality, it is also an injudicious practice to feed too highly, and hasten maturity with stimulating food.

A bull should grow up naturally into a healthy, well-developed animal, maturing at the time and in the way in which nature has chosen, *liberal* feeding, but *no forcing* being the rule. Milk should be given for the first six or eight months; this is the natural diet and therefore the best for the young animal. It may, however, be supplemented with a similar amount of food as has already been recommended for young calves, such as oat, pea, barley, or oil meal, and grass, hay, or ensilage, etc., according to the age and season.

After weaning, he should be provided with a plentiful supply of succulent and nourishing, though not rich food. A young bull whose growth has been forced for show purposes, although he may be a finer looking animal by such treatment, will not be as valuable for breeding as though he had been fed more judiciously. It is found by experienced breeders, that it is unwise to use a bull for breeding purposes until he is two years old. If used to

any extent previous to this period, the natural result will be to render him a less valuable animal for future use, while calves from such early service will not be as well developed and strong as they otherwise would be.

When two years of age he may be safely used for service from fifty to seventy-five times during the season; after this period the number may be extended to one hundred or even more per season. If he proves a good stock getter, and is not a vicious animal, he may be used as a breeder until he begins to fail, which will generally be from ten to twelve years of age. Two noted bulls, owned and used in the herd of Robert Colling, were employed for breeding purposes until they were respectively thirteen and fifteen years old, having begun service at two years. In order to make a bull gentle and render him more easily managed, he should be early taught to lead, and be accustomed to frequent handling. When two or three days old he should have a strap put about his neck, to which a rope three or four feet long should be attached. By being tied in a stable in this manner for a time, and occasionally led about, he will soon learn to submit to a power stronger than himself, a lesson that will be a valuable one; still every precaution should be taken as the animal grows older, to avoid as far as possible, all danger from injury by a cross bull, for it frequently happens that a bull that has previously been kind and gentle will become unaccountably and suddenly vicious, attacking the person having charge of him without the least warning.

When about eight or nine months old, a copper ring should be put in his nose. Steel and iron are sometimes used for this purpose, but they corrode more than copper, and should not for this reason be recommended. A strong stick, seven or eight feet long, with two links of chain and a snap hook at the end, fastened to the ring in the nose, is the safest arrangement for leading a bull, as he might, in case of a sudden attack upon his keeper, be kept from rushing upon him by this means, and which could not be done by simply a rope tied into the ring.

Instances are not rare of persons being severely injured or killed by neglecting to observe these precautionary measures. It is never safe to trust even the most pleasant tempered bull without precautionary measures against danger, for there is generally no warning against the sudden frenzy that might seize the animal. Therefore a ring in the nose, or some equally good substitute should always be employed.

Some bulls are naturally vicious, others are made so by being teased, or by harsh and violent treatment. A decidedly vicious bull is not only a dangerous animal to keep, but will be liable to transmit this characteristic to his offspring, and would best be disposed of to the butcher.

A bull should be treated kindly, and yet always managed with firmness. The keeper should never let him know that he is afraid of him, and yet he should never be trusted, however seemingly gentle in disposition.

When fully matured, a bull will get stronger and better calves than when young; it is therefore the opinion of most breeders that the most desirable age for the bull as a getter of stock is when he is from five to ten years old, being then fully matured and well developed in all respects. Though well fed at all times, he should never be kept very fat; when used in constant service, he should be fed more than at other times. When kept in a stable, he should be led about the yard for a time each day for exercise. No animal will be healthy without a sufficient amount of sunlight and exercise. A better plan than to keep him constantly in a stable, is to permit him the range of a small yard leading from the stable, where he can go from one to the other as he chooses. The practice of turning a bull into the common pasture with the cows is not to be recommended.

A bull should be groomed with the curry-comb or brush, and his skin kept clean and free from dandruff by this means and occasional washing. He should not be kept entirely apart by himself, when confined in the barn, but should have a stall where he can see the other cattle. This will make him more contented and quiet.

Winter Protection for Cattle.—There can be no question that the most profitable and economical method of cattle management in winter, for the main portion of our country, is to provide warm shelter and protection against storms and the inclemency of the weather. Where cattle are exposed to the cold weather during the winter season, a much larger proportion of food is required to keep up the animal heat, than where a comfortable shelter is provided, since food is required to sustain animal heat, and always in proportion to the intensity of the cold; and setting entirely aside all considerations respecting the cruelty to animals of exposing them to the cold storms of winter, it seems to us that any farmer will find it more profitable in a term of years to provide good barns to shelter his stock, than to furnish the extra amount of food required to warm the cattle, and keep them in good condition.

With the modern conveniences for handling fodder in barns, the labor of doing this is not much greater than feeding them in the open fields, while all the waste and inconvenience attending the latter would be avoided. It has been estimated that the difference in the amount of food required to maintain cattle in warm, comfortable stables in winter, as compared with the amount of food necessary to produce the same weight in the open air, is as sixteen to twenty-eight; that is, sixteen pounds of corn would be required for the former, while twenty-eight pounds would be necessary for the latter. This may seem a large allowance to make in food for the difference in temperature between warm stables and the open air, but we believe if the experiment were carefully tested, it would be found none too large, when all the conditions were taken into consideration.

The temperature alone is not the only consideration; when animals are out in the storm with no protection except the windward side of a hay stack, or when obliged to stand shivering for hours in the fence corners, and the hair gets saturated to the skin with melted snow or rain; in such cases there is not only the temperature to withstand, but an extra amount of heat must be supplied from the body to evaporate the moisture. A western writer of note states that the storms of winter in that section are so trying to animals exposed to them, that many farmers have found it impossible to produce any gain with one half bushel of corn fed per day to each steer during a stormy February and March.

Young cattle that cannot be kept growing during the winter, and all others that cannot be kept in good condition will have to make up the deficiency afterwards in a larger proportionate length of time and amount of food to accomplish it, and such a system of management is consequently not attended with as large profits to the farmer as where the growth of the young animal is constantly kept up, and stock are kept in good condition. It not unfrequently happens that calves that are left out during the winter exposed to the cold, seem no larger, if as large, in the spring than they did at the beginning of the winter, and will require several months to make up what they have lost during that time, while they will never wholly recover from the effects of having their growth arrested at this growing period, but will be in a measure dwarfed and stunted.

We have already treated at such length in the department of Farm Buildings, the importance of properly constructed stables, that anything additional in this connection would seem a repetition; suffice it to say that stables should always be so constructed that the walls cannot be penetrated by wind and snow. Stables, the walls of which have cracks that will admit a constant draft upon animals confined within them, or that in snow storms will permit the snow to cover their backs, are little, if any, better than none; since if out in the open field cattle would be able to walk about and keep up a circulation by exercise, while tied in the stable they are unable to do this. Stables should also be so ventilated that pure air may be supplied to the animals, and the bad air conducted away without exposing them to a current.

All stock, when stabled, should have some exercise every day in the open air if the

weather is not stormy or too cold. If the sun shines they should be allowed their liberty for a while in a warm sheltered yard. A sun bath is one of the best things a farmer can permit his cattle to enjoy in winter, as it is a promoter of health and general thrift.

Where cattle are kept in such large numbers that it would be impossible to provide stables for them, as in the extensive grazing regions of the west, for instance, a sufficient number of sheds should be provided, where the cattle can seek protection when they wish. In the extreme Southern States, the climate is such that excellent pasturage may be furnished for stock during the entire winter. The varieties of grasses best suited to this purpose have already been given in Grasses and Forage Plants. The farmers of this section have but little trouble or expense in wintering their cattle, compared with that of the Northern farmer.

Food for Cattle.—A sufficient amount of suitable food is necessary to keep cattle in a thriving condition, and this should be furnished them regularly at all times. By suitable food we mean that which contains in proper proportions the elements for the formation of fat, bone, and muscle. It seems to be the opinion of some farmers,—if we may judge by their methods of practice,—that it makes but little difference what cattle are fed upon during the winter, providing they can be so managed as to be taken through the winter in some way, until the pastures are ready for spring grazing, and if they come out of their winter quarters "spring poor," it is no more than is to be expected. We accordingly find it no uncommon thing for cattle to present a half-starved appearance in the spring, having only about one-half the amount of flesh on their bones that they did in the autumn.

Farmers pursuing such a course do not appear to consider that by their method the growth of the animal is lost during the winter, and that it will take a large portion of the summer to make up this loss. In order to keeping animals steadily growing the food must not only be good in quality, but of sufficient quantity. What is claimed for the famous beef breeds is, that from long, pure, and skillful breeding, they have attained the highest capacity to utilize food in producing the best quality of beef in the shortest possible time, and at the least cost; yet, even with such breeds no good beef can be produced without appropriate food in sufficient quantity, given at proper intervals. The same may be said of the utility of the most valuable dairy breeds; the highest success cannot be attained without their being properly fed and otherwise cared for.

While it is true that much depends upon the breed, it is equally true that much also depends upon the food, and general management with respect to maintaining the excellent qualities of the breed, and securing the highest results from them. It is the law of nature that plants and animals are modified by the character of the food which sustains their growth. Plants growing near the sea take from the soil impregnated with its salt a large proportion of soda, which is seen in the ash of the plant when analyzed; but on removing these plants inland, they take from the soil potash, instead of soda, and the plant is accordingly modified. It is a well known fact that wheat of the same variety will possess qualities according to the soil upon which it grew, and that which is grown upon a clayey soil usually contains the largest proportion of gluten.

The wild turkey, after being domesticated for a time, loses the peculiar flavor of its flesh, which cannot be distinguished from that of the common turkey. Dr. Bachman states that he has seen turkeys raised from the eggs of the wild species lose their beautiful metallic tints and become spotted with white in the third generation. The wild ducks in the ponds of St. James Park, which had never been crossed with domestic ducks, are said by Yarrell to lose their true plumage after a few generations. Numerous other instances might be cited to show the effect of food in changing the qualities and characteristics of plants and animals, but a sufficient number have been given to illustrate the importance of giving all animals good and suitable food, and a liberal supply of it. The food which nature has provided for

cattle, and which seems to be the chief reliance of the farmer, consists of the mixed grasses of the pasture, or their equivalents in hay or ensilage.

To these, as circumstances and conditions may require, are added grain of various kinds, roots and other edible material. In the northern section of the country, where the winters are long, cattle should have their pasture supplemented with other food quite early in the season. This prevents them losing flesh at the beginning of the winter, and enables them to go into their winter quarters in good condition. The grasses become greatly injured by the hard frosts for a long time before snow covers the ground, and as an article of food lose in this way much of their nutritive properties. When, therefore, the pasturage begins to fail, cattle should be fed with a suitable amount of other food to make up this deficiency, the quantity given being increased as the season advances, until the pastures come to be depended upon.

This will prove a more economical method than to allow the cattle to lose flesh before winter sets in, although it requires a larger amount of hay and grain to be used during the season. It is the poorest kind of policy to delay giving grain or other feed to cattle until they are finally placed in their stables for winter. At all events, individual animals that have not attained a good condition should be selected out and given an extra allowance of food of the best quality.

There is an old adage commonly repeated, but none the less true, that it will be well for all farmers to bear in mind in this connection, which is as follows: "A beast well summered, is half wintered; and well wintered, is half summered." By heeding the above maxim, no time will be lost in the growing period of the animal, or in recovering from the poor condition occasioned by insufficient food. Cattle should be in good condition at the beginning of winter, and kept so through the season.

Quality and Quantity of Food, etc.—With respect to the quality and quantity of food to be given cattle, no definite rule can be prescribed which would apply to all cases, each depending upon many and varying circumstances, such as age, the use required of the animal, the season, the system of feeding, etc. Some cattle require a much larger amount of food in proportion to their size than others. In all cases the quantity will be largely influenced by the quality. Under no circumstances should cattle be kept hungry, but should always have a sufficient amount of food to satisfy hunger, for both humane reasons and those of economy, it being the most unprofitable course for any farmer to pursue to keep cattle or any animal in a half-starved condition.

Young cattle should always be fed well, for there is no time in the life of an animal when good food and a liberal supply in proportion to the size, is as much in demand or pays as well to supply, as when the animal is growing. This is the time when the system is to be built up with flesh and bone material, and increased in size; besides the ordinary wastes are to be met, and a good supply of the material in the form of proper food must be given to accomplish it all. They therefore require more food in proportion to their size than mature animals, in which the muscular substance and bone structure are fully formed.

If beef is the object, the food given must be in quality and quantity to produce the best and largest amount of beef in the shortest possible time. Milch cows should be given food that will induce the largest secretion of milk; they also require that of a better quality than stock having no such drain upon the system. When an ox is being worked, he should have an additional amount of food given to that allowed when idle.

Corn meal is excellent, combined with grass, hay, or ensilage. either for oxen that are being fattened or for those used in labor, the former of course being fed much the largest quantity of meal. Roots are excellent for milch cows, also ensilage, cut feed, such as hay, oats, millet, or corn stalks mixed with shorts, and corn meal, linseed or cotton seed meal, thoroughly moistened with water. Warm water should be used for moistening in winter. Oat meal and a few roots are good food to supplement hay or ensilage for young cattle.

It is well understood that cattle or any other stock will gain more rapidly on a variety of food, than when confined to a few kinds only, and the feeder must use skill and judgment in making a proper allowance for a difference in the quality of different varieties. Another important point in the care of cattle, and one which many farmers are slow to learn, is the variation of the amount of food according to the temperature. In very cold weather, the first demand made upon the food consumed by the animal is to maintain animal heat; if there is a surplus beyond this, it goes to build up the tissues of the body and store up fat. If therefore, only a sufficient supply of food is given to maintain a proper degree of animal heat, and not enough to maintain the general waste of the system beside, there must be a falling away in flesh as a natural result.

Where cattle have a free range of pasturage, or where soiling is practiced, there will be no difficulty with digestion, and there will be a good condition, as far as the bowels are concerned; when confined in stables, with little or no exercise, and fed mainly on dry food, as is frequently the case in the winter management of stock, or when suddenly changing from grass to hay, it frequently happens that a very different condition will exist, which, if neglected, may lead to serious evil. In such cases, a judicious use of bran, corn meal, ground oats, or oil cake, will counteract the constipating tendency. Roots, such as turnips, potatoes, etc., given in sufficient quantities will also be valuable under such conditions. Salt is likewise frequently used with good effect, permitting the animal to drink freely afterwards; the presence of a large quantity of water in the bowels having a similar effect to an injection of water.

Rations for Farm Animals. — The following table of feeding standards is given by Dr. Wolff of the Agricultural Academy at Hohenheim, based upon the careful experiments made at the German Experiment Stations in feeding, and the analyses of different kinds of food, embracing a period of twenty-five years. Although it is not by any means claimed that they are not subject to improvement, yet they will serve as a guide to the farmer in determining the approximate amount and value of food rations for farm stock under different conditions and circumstances.

The table gives the quantities and proportions of the digestible food elements which are to be given in the daily rations of farm animals in order to secure the most satisfactory results. The term "total organic substances," as used in the table, means the organic matter of feed considered free from water and ash; and the difference between total organic substances and "total nutritive substances," expresses the quantity of indigestible or undigested portion of the ration. The column of the table headed "nutritive ratio," gives the proportion of digestible albuminoids to digestible carbohydrates, including fat.

With regard to the food elements of the following table, a leading agricultural authority says:

"The albuminoids, which are represented in animal food by the casein or curd of milk, the white of egg and lean meat, and in vegetable food by the gluten of wheat (wheat gum), and other substances quite similar to milk, casein and egg-albumin, have a different physiological significance from the carbohydrates, which are fiber or cellulose, starch, the sugars, the gums, and similarly constituted matters. The albuminoids may easily be made over by the animal into its own substance, i. e., into muscles, tendons, and the various working tissues and membranes which are necessary parts of the animal machine, because they are the same kind of materials, and, chemically speaking, of the same composition.

The carbohydrates, on the other hand, probably cannot serve at all for building up the muscles and other parts of the growing animal, and cannot restore the waste and wear of those parts of mature animals, because they are of a very different nature. They contain no nitrogen, an element which enters into all the animal tissues (albuminoids) to the extent of some fifteen per cent. of their dry matter.

TABLE OF FEEDING STANDARDS.

PER DAY AND PER 1,000 LBS. LIVE WEIGHT.

	Total organic substance.	Nutritive (digestible) substances.			Total nutritive substance.	Nutritive ratio.
		Albuminoids.	Carbohydrates.	Fat.		
	lbs.	lbs.	lbs.	lbs.	lbs.	
1. Oxen at rest in a stall, . . .	17.5	0.7	8.0	0.15	8.85	1:1.2
2. Wool sheep, coarser breeds, . .	20.0	1.2	10.3	0.20	11.70	1:9.0
" " finer breeds, . .	22.5	1.5	11.4	0.25	13.15	1:8.0
3. Oxen moderately worked, . .	24.0	1.6	11.3	0.30	13.20	1:7.5
" heavily worked, . . .	26.0	2.4	13.2	0.50	16.10	1:6.0
4. Horses moderately worked, . .	22.5	1.8	11.2	0.60	13.60	1:7.0
" heavily worked, . . .	25.5	2.8	13.4	0.80	17.00	1:5.5
5. Milk cows, ...	24.0	2.5	12.5	0.40	15.40	1:5.4
6. Fattening oxen, 1st period, . .	27.0	2.5	15.0	0.50	18.00	1:6.5
" " 2d " . .	26.0	3.0	14.8	0.70	18.50	1:5.5
" " 3d " . .	25.0	2.7	14.8	0.60	18.10	1:6.0
7. Fattening sheep, 1st period, . .	26.0	3.0	15.2	0.50	18.70	1:5.5
" " 2d " . .	25.0	3.5	14.4	0.60	18.50	1:4.5
8. Fattening swine, 1st period, . .	36.0	5.0	27.2		32.50	1:5.5
" " 2d " . .	31.0	4.0	24.0		28.00	1:6.0
" " 3d " . .	23.5	2.7	17.5		20.20	1:6.5
9. Growing cattle:						
Age, months. Average live weight per head.						
2—3 150 lbs. . .	22.0	4.0	13.8	2.0	19.8	1:4.7
3—6 300 " . .	23.4	3.2	13.5	1.0	17.7	1:5.0
6—12 500 " .	24.0	2.5	13.5	0.6	16.6	1:6.0
12—18 700 " .	24.0	2.0	13.0	0.4	15.4	1:7.0
18—24 850 " . .	24.0	1.6	12.0	0.3	13.9	1:8.0
10. Growing sheep:						
5—6 56 lbs. . .	28.0	3.2	15.6	0.8	19.6	1:5.5
6—8 67 " . .	25.0	2.7	13.3	0.6	16.6	1:5.5
8—11 75 " . .	23.0	2.1	11.4	0.5	14.0	1:6.0
11—15 82 " . .	22.5	1.7	10.9	0.4	13.0	1:7.0
15—20 85 " . .	22.0	1.4	10.4	0.3	12.1	1:8.0
11. Growing fat pigs:						
2—3 50 lbs. . .	42.0	7.5	30.0		37.5	1:4.0
3—5 100 " . .	34.0	5.0	25.0		30.0	1:5.0
5—6 125 " . .	31.5	4.3	23.7		28.0	1:5.5
6—8 170 " . .	27.0	3.4	20.4		23.8	1:6.0
8—12 250 " . .	21.0	2.5	16.2		18.7	1:6.5

The carbohydrates cannot restore the worn out muscles or membranes of the animal any more than coal can be made to renew the used up packing, bolts, valves, flues, and gearing of a steam engine. The albuminoids are to the ox or the man what brass and iron are to the machine, the materials of construction and repair.

The carbohydrates are, furthermore, to the animal very much what coal and fuel are to the steam engine. Their consumption generates the power which runs the mechanism. Their burning (oxidation) in the blood of animals produces the results of life just as the combustion of coal in the fire-place of the steam engine produces the motion and power of that machine.

There is, however, this difference between the engine and the animal. The former may be stopped for repairs, the latter may run at a lower rate, but if it be stopped it cannot resume work. Hence the repairs of the animal must go on simultaneously with its wastes. Therefore, the material of which it is built must admit of constant replacement, and the dust and shreds of its wear and tear must admit of escape without impeding action.

The animal body is as if an engine were fed with coal and water not only, but with iron, brass, and all the materials for its repair, and also as if the engine consumed its own worn out parts, voiding them as ashes or as gas and smoke. The albuminoids, or blood and tissue-

formers, are thus consumed in the animal, as well as the carbohydrates, or fuel proper. The fact that the albuminoids admit of consumption implies that when the carbohydrates or proper fuel are insufficient, they, the albuminoids, may themselves serve as fuel. Such is the case, in fact. But, nevertheless, the two classes of substances have distinct offices in animal nutrition, and experience has demonstrated what science predicted, viz.: that for each special case of animal nutrition a special ratio of digestible albuminoids to digestible carbohydrates is the best and most economical, and, within certain limits, is necessary."

Feeding Value of Different Articles of Food, etc. — The following table, giving the average composition, digestibility, money value, etc., of different articles of food as given by Dr. Wolff, will, in connection with the previous table, be of value to the farmer in determining the kind and amount of feed for different farm animals.

AVERAGE COMPOSITION, DIGESTIBILITY, AND MONEY VALUE OF FEEDING STUFFS, AS GIVEN BY DR. WOLFF.

	Water.	Ash.	Nitrogenous Matters, Albuminoid and Amides.	Fiber.	N. fr. Extract.	Fat.	Digestible nutrients. Albuminoids.	Carbohydrates incl. fiber.	Fat.	* Nutritive Ratio.	Value. Dollars per 100 pounds.	Comparison with meadow hay = 1.
Meadow hay, poor, . .	14.3	5.0	7.5	33.5	38.2	1.5	3.4	34.9	0.5	10.6	0.48	0.74
" " fair, . .	14.3	5.4	9.2	29.2	39.7	2.0	4.6	36.4	0.6	8.3	0.55	0.86
" " average, .	14.3	6.2	9.7	26.3	41.4	2.5	5.4	41.0	1.0	8.0	0.64	1.00
" " very good, .	15.0	7.0	11.7	21.9	41.6	2.8	7.4	41.7	1.3	6.1	0.74	1.17
" " extra, . .	16.0	7.7	13.5	19.3	40.4	3.0	9.2	42.8	1.5	5.1	0.84	1.32
Clover hay, average, . .	16.0	5.3	12.3	26.0	38.2	2.2	7.0	38.1	1.2	5.9	0.69	1.08
" " best, . .	16.5	7.0	15.3	22.2	35.8	3.2	10.7	37.6	2.1	4.0	0.88	1.39
Timothy hay, . . .	14.3	4.5	9.7	22.7	45.8	3.0	5.8	43.4	1.4	8.1	0.69	1.09
Hungarian hay, . . .	13.4	5.7	10.8	29.4	38.5	2.2	6.1	41.0	0.9	7.1	0.66	1.04
Rye straw, ...	14.3	4.1	3.0	44.0	33.3	1.3	0.8	36.5	0.4	46.9	0.35	0.55
Oat "	14.3	4.0	4.0	39.5	36.2	2.0	1.4	40.1	0.7	29.9	0.44	0.69
Rich pasture grass, . .	78.5	2.2	4.5	4.0	10.1	1.0	3.4	10.9	0.6	3.6	0.27	0.42
Average meadow grass, fresh, ...	70.0	2.1	3.4	10.1	13.4	1.0	1.9	14.2	0.5	8.1	0.22	.36
Green maize, . . .	85.0	1.0	1.2	4.7	7.6	0.5	0.7	7.4	0.2	11.3	.10	.16
Cured maize fodder, . .	27.3	4.2	4.4	25.0	37.9	1.3	3.2	43.4	1.0	14.4	.57	.91
Potatoes, ...	75.0	0.9	2.1	1.1	20.7	0.2	2.1	21.8	0.2	10.6	.29	.46
Carrots, ...	85.0	0.9	1.4	1.7	10.8	0.2	1.4	12.5	0.2	9.3	.18	.28
Mangolds, ...	88.0	0.8	1.1	0.9	9.1	0.1	1.1	10.0	0.1	9.3	.14	.22
Rutabagas, . . .	87.0	1.0	1.3	1.1	9.5	0.1	1.3	10.6	0.1	8.3	.15	.24
Turnips, ...	92.0	0.7	1.1	0.8	5.3	0.1	1.1	6.1	0.1	5.8	.11	.16
Sugar beets, . . .	81.5	0.7	1.0	1.3	15.4	0.1	1.0	16.7	0.1	17.0	.19	.30
Maize, German, . . .	14.4	1.5	10.0	5.5	62.1	6.5	8.4	60.6	4.8	8.6	1.10	1.73
" American, . .	14.4	1.5	10.7	2.0	66.5	4.9	9.0	63.3	3.7	8.0	1.12	1.75
Oats, ...	14.3	2.7	12.0	9.3	55.7	6.0	9.0	43.3	4.7	6.1	.97	1.53
Rye, ...	14.3	1.8	11.0	3.5	67.4	2.0	9.9	65.4	1.6	7.0	1.09	1.68
Barley, ...	14.3	2.2	10.0	7.1	63.9	2.5	8.0	58.9	1.7	7.9	0.95	1.47
Peas, ...	14.3	2.4	22.4	6.4	52.5	2.0	20.2	54.4	1.7	2.9	1.44	2.25
Field Beans, . . .	14.5	3.1	25.5	9.4	45.9	1.6	23.0	50.2	1.4	2.3	1.51	2.36
Squashes, ...	89.1	1.0	0.6	2.7	6.5	0.1	0.4	7.1	0.1	18.4	.08	.13
Malt sprouts, . . .	10.1	7.2	24.3	14.3	42.1	2.1	19.4	45.0	1.7	2.5	1.31	2.06
Wheat bran, coarse, . .	12.9	6.6	15.0	10.1	52.2	3 2	12.6	42.6	2.6	3.9	1.04	1.63
" " fine, . .	13.1	5.4	14.0	8.7	55.0	3.8	11.8	44.3	3.0	4.4	1.03	1.62
Middlings, ...	11.5	3.0	13.9	4.8	63.5	3.3	10.8	54.0	2.9	5.7	1.07	1.68
Rye Bran, ...	12.5	5.2	14.5	5.7	58.6	4.5	12.2	46.2	3.6	4.5	1.10	1.72
Cotton seed cake decorticated.	11.2	7.6	38.8	9.2	19.5	13.7	31.0	18.3	12.3	1.6	2.05	3.22
Dried blood, . . .	12.0	4.1	80.8	...	2.6	0.5	54.1	2.6	0.5	...	2.39	3.76
Whey, ...	92.6	0.7	1.0	...	5.1	0.6	1.0	5.1	0.6	6.6	.11	.18
Milk, ...	87.5	0.7	3.2	...	5.0	3.6	3.2	5.0	3.6	4.4	.34	.53

* Nutritive ratios are read, 1: 10.6, 1: 8.3, etc.

Cattle should be fed several times a day, and at regular intervals. They should be given all they will eat, but not so much at a time that they will leave a large portion, and waste it, or render it unfit for food by breathing upon and working it over. What remains in the mangers can be swept out and used for bedding. Some farmers feed only three times a day, but many prefer to feed four or five times a day. No definite routine or system of feeding can be prescribed which will apply to all cases.

The practice of the writer is usually to feed twice in the morning, and once each at noon and night, the noon feeding frequently being done in the yard, when the cattle are let out for a little exercise.

Pure water should always be furnished in abundance at a place where all the cattle can have access to it. Never allow them to drink stagnant or filthy water, but keep the troughs and tanks for drinking purposes clean and well filled. These should be located in a sheltered place where all can have an equal chance, and the weaker ones may not be kept away by the stronger and ruling members of the herd. The more common practice among farmers of watering stock only once during the twenty-four hours is not to be recommended. All domestic animals should have plenty of water furnished them at least twice a day, and we think those animals thrive best that have access to it whenever they wish.

Cattle should also have a sufficient supply of salt. This is indispensable to their health and comfort, being not only a luxury, but a necessity to them. It is well to have a few quarts of salt kept in a box under a shed, to which they can have access whenever they wish. By this means they will eat little and often; but when they have not had the salt for a long time it is better to give them a small quantity of it every day until they become accustomed to it, before allowing them to take it whenever they wish.

Soiling.—The term "soiling" is applied to the cutting and feeding while green, such forage crops as may be profitably raised for the purpose. This system is practiced instead of pasturing in many sections, and has its peculiar advantages in localities where the latter method of management is inconvenient or unprofitable. While many farmers, having an abundance of good pasturage might find soiling unprofitable, there are others so situated that it would prove highly advantageous, and the profits of the farm be largely increased by its adoption.

It is admirably adapted to localities in the vicinity of cities and villages where pasturage is scarce and expensive, or to those farms where it is desirable to maintain a large number of cattle on a small area of land, and would prove more profitable under such circumstances than where the land is rich and cheap. Soiling has been practiced in Europe quite extensively, and also in this country considerably in certain sections during the past few years, the system, like all things new, gradually making its way against the opposition of the adherents of the older and common method of pasturing. Where conditions favor it, and when fairly tested, it is generally regarded as a great improvement over the ordinary system of management. It however requires considerable labor, foresight, and management in order to secure the best results.

With this method, arrangements must necessarily be made for enclosing the cattle in stables, sheds, or yards while being fed, as well as an enclosure near the former sufficiently large to admit of exercise in dry weather. The winter stables would of course be generally found most convenient and economical for this purpose, requiring no additional outlay in buildings or sheds. Some farmers use for this purpose open sheds with suitable racks or mangers.

Advantages of the Soiling System.—The advantages of soiling might be summed up in the following: By this means a large amount of dairy products is secured throughout the season, as an increased flow of milk is the result of this practice when properly

managed; provision is also made against the failure of pastures. It obviates one of the most expensive features of ordinary farming by the saving of fences, and prevents the seeding of weeds. It also saves land that may profitably be used for other purposes than pasturing, in those sections where land is valuable and expensive, since, with the same degree of fertility, considerably less than one-half the area of land will be required to yield an equal amount of forage crops to that which is fed from the grazing system. The cattle are protected and kept more comfortable in this way, and are prevented from tramping and wasting more fodder than they will eat. It more than doubles the amount of stock that may be kept on a given area of land, while there is a vast increase in the amount of manure that may be saved by this means, and which would be mostly lost by pasturage.

It requires some additional labor, but it is claimed by the advocates of the soiling system generally that the benefits derived are so much greater than from pasturing, that they more than compensate for the extra labor and care attending it.

Objections to the System.—The objections to the system of soiling that have been urged by its opponents are, that it requires considerable additional labor, close attention, and careful management. That during the hot weather, unless particular pains are taken to keep the stables clean, there will be a tendency to produce unsanitary conditions, not only among the cattle, but also in the dwellings that may be adjacent, the air becoming vitiated; that it is also more difficult to keep the milk sweet and free from taints.

In many parts of the country there is an abundance of pasture, while the owners of farms have at the same time all the land under cultivation that they can properly care for, and under such circumstances the adoption of the soiling system would render a portion of the land entirely useless. Besides, its adoption would bring the extra care and labor attending it into the season which, to the farmer, is the most busy of the whole year.

Soiling and Pasturing Compared.—The following experiment was made not long since by Mr. E. Brown, of Mankle, Scotland, a farmer of extensive operations, who was desirous of testing the comparative merits of soiling and pasturing cattle, the results of which, as will be seen, are considerably in favor of soiling.

In the spring he took forty-eight Aberdeenshire bullocks which had been wintered in his farm-yard, and separated them fairly into two equal lots, one of which he put to grass, while the other was soiled. The latter were fed on Swedish turnips until the clover was ready for cutting, and then the clover was given sparingly for a week, in order to avoid danger from over-eating, after which a full supply was allowed. The animals thrived exceedingly well until the grass got hard and withered. About the last of July, the clover having ripened, vetches were substituted, which were continued until the second crop of clover was ready for cutting. Ten of the soiled lots were sold in August, and the remainder of the two lots in September.

The results are thus stated: The forty-eight cattle cost in purchase and wintering, £503 2*s.* The best ten of the soiled lot sold at £17 5*s.* each; the remainder of the two lots sold at £14 5*s.* each; the soiled lot thus bringing £377, and the grazed lot £342, a difference of £35 in favor of the soiled cattle. It required one and three-quarters acres of Swedish turnips, eight acres of clover, and three acres of vetches, to furnish the food consumed by the twenty-four soiled cattle.

Mr. H. Stewart gives his opinion of the soiling system, the result of practical experience, as follows:

"The supposed large cost of soiling is the principal objection to the practice with most persons. It is useless to claim that it is not more costly than pasturing, so far as labor is concerned; but at the same time when well managed it is certainly more profitable. There are times and places in which it is more profitable to grow small crops with a small

expenditure of labor; and others in which it pays best to expend more labor and produce greater crops. It depends upon the amount invested in the farm and stock. If one cow can be pastured and fed on ten acres of land costing $20 per acre, $200 in all, and produces $50 worth of milk in the year, then it pays to pasture and grow grass and corn for her feed. But if the land costs $200 per acre, the cow must be fed from one acre or produce more than $50 to be even with the other case. Now a cow cannot be fed on less than five to ten acres of land without soiling either partially or wholly. But by soiling, a cow can be fed the year through on two acres, and the income may be brought up to at least $50 per acre. This is done by combining the production of some salable crops that will produce fodder as well, with the production of milk or butter, and by so utilizing the labor that as little as possible may be lost in this direction.

I have said that one boy can attend to forty cows. I repeat it. For two years I have soiled cows under somewhat unfavorable circumstances. My land was very poor—a run-down light soil. My only hope to make anything from it was to keep cows for the production of milk and butter, and make manure to enrich the soil, both to grow feed for the cows and market crops for sale. Being within easy distance of the New York market there could be no better situation for such an enterprise. I kept fifteen cows. Besides the fifteen cows there were three horses, seven heifers, and one bull, and some pigs. All the cleaning, feeding, and attendance on these animals was done by one boy of fourteen years, for one year, and the boy had considerable time to spend in field work. On this result I base my statement that one boy can attend to forty cows. But to do this, there must be convenience of arrangement and labor-saving methods.

I will begin with the morning work of the boy referred to, and follow it through the day. At half-past four or five in the morning he cards and brushes off the loose dirt from the fifteen cows, which is an easy job as they are well bedded and lie upon a raised platform with a gutter in the rear to receive the droppings. Any manure or fouled litter that may be on the platform is drawn into the gutter with a broad hoe, to leave everything clean for the milker. Before he has finished, milking has begun at the other end of the stable. The boy then washes his hands in a bowl kept for the purpose in the stable, and helps to milk. In one hour the milking is done; the boy helps to carry the milk to the milk-house, and returns to the stable and feeds the cows.

The feed is already in the feed passage, if it is the summer time, and five minutes is ample time to do this job. One hour will then have elapsed, and while the cows are feeding the boy goes to breakfast. After breakfast he returns to the stable, pumps water from the spring into the water trough, and turns the cows into the yard to the water. The horses are then cleaned and harnessed; the yearlings and bull are fed and watered; the stable cleaned out, and another hour is thus used up.

About half-past eight he will be on his way to the field with the one-horse wagon, where he hitches on to the mower and cuts feed for the next day, leaving it on the ground; he then gathers up and loads what was cut the previous day, and brings it to the barn. It is now 10 o'clock, and the boy will clean out the horse stable and pig-pen, and wheel the manure into the basement under the cow stable, and spread evenly. He may then give the cows some fodder in the yard, and do odd jobs until dinner time. After dinner he goes to the field and works there until half-past four, when he returns to the stable, feeds the cows there, and gets ready for milking about 5 o'clock. Calves and pigs are fed, and such preparations as may be necessary are made for the next morning's work, and at 6 o'clock the day's work may be finished. After supper the stable is visited and the cows are fed again, which is about five minutes' work, and that ends the day.

It can be readily seen that to prepare the feed in the winter will be very little more work than in the summer. There are roots to cut; hay or corn fodder to cut; feed to

prepare; but it will take no more time to do this in the barn than to do similar work in the field. I think perhaps that those who know something of this kind of work, and how much time will be required, will readily believe, with a little help perhaps in the field, that a smart boy, who has nothing else to do, may feed and keep clean forty cows, kept in this manner. It is true that on a compact farm of sixty acres there will be less time lost in going back and forth from the stables to the fields than on a larger farm; but allowances of this kind are easily made.

In my own case, the practice of soiling has grown out of peculiar circumstances, and to give a minute statement would be misleading, and not nearly so favorable to the practice as it should be. My farm has been to a large extent an experimental one. Much land, fertilizers, and labor have been given for the purpose of experiments. Different kinds of cows have been kept for comparison, various feeds have been used, various implements have been tested; experiments in dairying and its effects have been made; but so far as the main business, the production of milk, butter, and some market crops is concerned, I am free to say that without the money made in that way I could not very well have paid my way in my other work. Generally, however, the results of my work are sufficiently clear and certain to show to me, and I think to other practical persons, that the labor involved in the practice of soiling is by no means so large as is generally supposed, and that in certain cases it may be made very profitable."

In adopting the soiling system, or any other method of practice, the farmer should first take into consideration the circumstances and conditions by which he is surrounded, the advantages to be gained, and difficulties to be met. While some farmers might make it very profitable, others might not; therefore a careful deliberation should first be given the subject, and the special circumstances and surroundings be fully considered. It is always a good plan to make such a change gradually, carefully testing the merits of the system before fully adopting it.

Soiling will frequently prove very advantageous to the farmer in connection with maturing stock, since it provides for a supply of food against the time of drouth and when the pastures begin to fail. The amount of forage to be cultivated to supplement the pasturage would not be proportionally large in such cases, and would almost invariably abundantly repay the labor attending it.

Crops for Soiling.—The principal crops used in soiling are clover, Indian corn, rye, and various other grains, grasses of different varieties, branching sorghum, and amber cane, millet, lucerne or alfalfa, common clover, alsike clover, the cow pea, and roots of various kinds, such as beets, turnips, carrots, etc. Broom corn has also been utilized with profit in this manner, after the brush has been cut off. As the seed is not allowed to ripen before the brush is harvested, the stalks are still tender and juicy, and if cut at once make quite nutritious forage. The stalks should be passed through a corn stalk cutter and mixed with a little bran, meal, or shorts before being fed. Sorghum and amber cane are preferred by many to sweet corn, since they produce nearly the same weight as the latter and are more nutritious.

The forage crop most extensively used in soiling is perhaps corn. It is not of course the most nutritious food, but the amount produced is so very large that the quantity fully makes up whatever deficiency there may be in quality. Nearly all the varieties of corn are used for this purpose, the sweet corn cultivated in gardens being generally preferred. It is more nutritious than the common field cultivated varieties, and the entire stalk much sweeter. The large gourd seed varieties of the common kind produce a much larger stalk when in tassel than the smaller varieties, but it is more coarse in fibre, and not as nutritious as the latter.

Some farmers who practice soiling are quite partial to the flint and smaller dent varieties.

Corn may be sown in drills or broadcast, the former method being usually considered the most desirable. The drills should be about three feet apart, using about a bushel of good seed to the acre. When the ears reach the milk state, the fodder is in the best condition for feeding; but it may be fed at any time after it has reached the height of three or four feet. Clover is best cut in the blossom; the same is true of most of the grasses and grains, as they are then moist, nutritious, and full of sap. They can, however, be cut at any season when necessary. They should always lie sufficiently long after cutting to become slightly wilted before feeding. Care should be used not to feed too much clover at a time, or, in fact, any green food. It is the practice of some to cut and mix one-fourth the quantity of cut hay or straw with green clover before feeding.

Methods of Soiling.—The methods of soiling are various, being modified by the feeder to suit different conditions and circumstances. As an illustration of this system, we give the method recommended by Mr. Waring, as follows:

"Early in the autumn sow three acres of winter rye, to be cut from May fifteenth to June fifteenth. Early in April, sow three acres of oats, to be cut from June fifteenth to July first; sow in April two acres of oats or barley, to be cut from July first to July fifteenth; early in May, two acres of oats or barley, to be cut from July fifteenth to August tenth; middle of May, two acres of corn, to be cut from August tenth to September first; middle of June, the three acres from which rye has been cut, to be sown with corn, to be cut from September first until September twentieth; early in July, the first three acres sown with oats should be resown with barley, to be cut from September twentieth until the harvest of roots and cabbages furnish a stock of green refuse, which will suffice until winter feeding commences."

The plan as above makes an allowance of twelve acres for maintaining twelve cows, and requires the cultivation of root crops aside from the regular operations of soiling. The roots cultivated are not intended for feeding until winter, but the tops make excellent soiling forage late in the fall. This is a larger allowance, on account of poor soil, than is commonly made; but if the season be good the surplus may be ensilaged or dried for winter feeding, while the large allowance provides against a possible drouth or any other unfavorable circumstance that might reduce the ordinary quantity of food. In September three acres of the four which were sown to oats or barley and corn may be sown to winter rye. This provides for the early crop for soiling the next year.

Mr. Quincy of Massachusetts, who was an earnest advocate of the system, and who probably did more to popularize it than any other man in his day, who also practiced it with great success upon his farm, states that he was enabled by soiling to keep thirty cows on the product of seventeen acres of his land, but which under the old system required fifty acres. This gentleman relied chiefly upon four kinds of green crops for carrying on the system, viz.: grass, oats, Indian corn, and cabbage. Grass was depended upon for the first month of the soiling season, it being cut from the earliest patches here and there about the farm buildings. He gives as the result of his experience, that one acre of good clover is sufficient to sustain six growing cattle from the twentieth of May to the twentieth of June. Oats were used for soiling in July at the rate of one acre for every four cattle soiled. The oats were sown as early as possible in the spring, and were generally sufficiently advanced to commence feeding by the first of July.

When oats are to be depended upon alone during this month, Mr. Quincy advises that one-half the quantity sown be put in the ground a week or ten days later than the early seeding. Indian corn was used in the month of August. During September, grass from the second crop was depended upon from those acres which supplied soiling material in the month of June. He states that the grass from the second crop will generally enable the farmer to carry on the soiling system to the fifteenth of October, if his grass land is in good condition.

From the fifteenth of October until the cattle are sheltered for the winter, the tops of vegetables, such as carrots, beets, turnips, etc., are used together with cabbages. The food was distributed in racks under cover in the barn regularly six times a day. Although feeding a less number of times is practiced by many, there are strong arguments in favor of numerous feedings. Less food will be given at a time, and it will always be fresh and in the best condition to be eaten. Like all other departments of farming, the system of soiling should be adapted to the conditions under which it is to be practiced, since no one method could be deyised to apply alike to all localities and circumstances. The cow pea makes an excellent soiling crop is sections suited to its successful cultivation, while the same is true of alfalfa or lucerne. In soiling, the food should be slightly salted about twice a week.

How to Determine the Age of Cattle. — Where cattle have horns, their age may usually be determined by these; but in hornless breeds the marks indicated by the teeth are the only means by which the age of the animal may be ascertained. Up to seven or eight years, the ages of cattle may be told with considerable accuracy by the number of rings at the roots of the horns. Steers, and heifers that are not breeding, show their first ring when three years old. When heifers breed at two years, it is found that they generally show a ring during that time, although there are some exceptions. The common rule for determining the age of cattle is, therefore, the appearance of one ring at the base of the horns at three years of age, two rings at four years, three at five, four at six, and five at seven, a ring being added yearly after the third year up to seven years.

As we advance beyond seven years, the rings become more or less distinct, and cannot be relied upon with any certainty. The short horns of bulls seldom indicate age with as much accuracy as those of oxen or cows. It not unfrequently happens that unprincipled dealers in cattle, as in horses, sometimes erase the age marks in order to make the animal appear younger than it really is. In cattle it is done by scraping off with a sharp knife one or more rings from the horns. Youatt has given such a reliable and definite description of the appearance of the teeth of cattle at different ages, that we extract it entire:

"The mouth of the new-born calf presents an uncertain appearance, depending on the mother having exceeded, or fallen short of the average period of utero-gestation. Sometimes there will be no vestige of teeth, but generally, either two central incisors will be protruding through the gums, or they will have arisen and attained considerable bulk.

At the expiration of the third week the animal will have six temporary incisors or front teeth.

At a month, the full number of incisors will have appeared. These are the temporary or milk teeth. The enamel will be seen covering the whole of the crown of the tooth, but not entering into its composition as in the horse, and it will be observed that the edge is exceedingly sharp. The only indication of increasing age, will be the wearing down of these sharp edges, and the appearance of the bony structure of the tooth beneath. The two corner teeth will be scarcely up before the center teeth will be a little worn.

At two months, the edge of the four central teeth will be evidently worn; yet, as the wearing is not across the top of the tooth, but a little out of the line of its inner surface, the edge will remain nearly or quite as sharp as before.

At three months, the six central teeth, and at four months the whole set will be worn, and the central ones most of all; but after the second or third month, the edge of the tooth will begin to wear down, and there will be more of a. flat surface, with a broad line in the center.

About this time a new change will begin, but very slowly, to be sure. The central teeth will not only be worn down on their edge, but the whole of the tooth will appear diminished; a kind of absorption will have commenced. There will be a little, but increasing space between them. The face of the tooth will likewise be altered, the inner edge will be

worn down more than the outer, and the mark will change from the appearance of a broad line to a triangular shape. The commencement of this alteration of form, and diminution of size, may be traced to about the fourth month. The central teeth are now not above half the size of the next pair, and they are evidently lessened.

At eleven months, the process of diminution will have extended to the four central teeth. The vacuities between them will now be evident enough.

At fifteen to eighteen months old, from the curious and diminutive appearance of all the incisors of a bullock of that age, we should think it difficult for him to obtain sufficient food to support himself in good condition.

It is somewhat so, and it may be in a great measure owing to these changes in the teeth, and the difficulty of grazing, that young beasts are subject to so many disorders from seven or eight months and upwards, and are so often out of condition. They contrive, however, to make up for this temporary disadvantage by diligence in feeding; and, to allude for a moment to another animal, we have known many, not only a broken-mouthed, but a toothless ewe thrive as well as any of the flock, for she was grazing all the day, and ruminating all night.

At this time, eighteen months old, the corner teeth will not be more than half their natural size; the center ones will be yet more diminished, and the vacuities between them will be almost equal to the width of the teeth. The faces of the teeth also, such faces as remain, will be lengthened; the triangular mark will diminish, and principally in the central teeth; while another, more or less deeply shaded, will begin to appear around the original mark.

All this while, the second set of teeth, the permanent ones, have been growing in their sockets, approaching towards the gums; but not as is said to be generally the case with other animals, and with the human being in particular, pressing upon the roots of the milk teeth, and causing them to be absorbed, until at length, losing all hold in the socket, they fall out. The process of absorption commences here in the whole milk-tooth, and as much in the crown or body of it, as at its root.

The process of general diminution seems now for a while retarded; it is confined to the central teeth, and they gradually waste away until they are no larger in the body than crow-quills. About the expiration of the second year, or a little before, the milk-teeth are pushed out, or give way, and the two central permanent teeth appear.

At two years old, then, there are two central permanent teeth, with six diminutive milk-teeth remaining; three on either side of the central permanent ones.

At three years of age, cattle have four central permanent teeth, with four milk teeth remaining; two on either side of the four central ones. The third pair are now getting ready, but the jaw is not yet sufficiently widened for the development of the fourth pair.

Now the remaining milk teeth will diminish very fast, but they show no disposition to give way, and *at four years old* there will be six permanent incisors, and often apparently no milk teeth, but if the mouth is examined, the tooth that should have disappeared and the tooth that is to remain until the next year, are huddled together and concealed behind the new permanent tooth. They are often a source of annoyance to the animal; and the tooth whose turn it was to go must be drawn. The four year old mouth, then, should contain six permanent incisors and two milk teeth.

At the commencement of the fifth year, the eight permanent incisors will be up; but the corner ones will be small. The beast, however, cannot be said to be *full-mouthed*, *i. e.*, all the incisors fully up, until it is six years old. It will be seen, though, by examining the mouth of five years, that the two central pairs are beginning to be worn down at the edges, and that in a flat direction, or somewhat inclined towards the inside.

At six years old, the teeth are fully grown, but this mark has extended over the whole

set, and all the teeth are a little flattened at the top; while on the two center ones there begins to be a distinct darker line in the middle, bounded by a line of harder bone.*

From this time the age can only be guessed at, and not decidedly affirmed; and a great deal will depend upon the manner in which the animal is fed. The beast that is most out, and that is compelled most to use his incisor teeth, will have them worn farthest down.

Perhaps, as a general rule, but admitting of many an exception, it may be said that at seven years old, this line is becoming broadest and more irregular in all of the teeth; and that a second and broader, and more circular mark, appears within the center of the former one, and more distinct in the central or two central pairs—and which at eight years has spread over the six central incisors.

A year afterwards, however, a change takes place which cannot be mistaken. The process of absorption has again commenced, and precisely where it did when the animal was four months old, viz., in the central incisors; but it is slow in its progress, and it is never carried to the extent to which we observed it in the milk teeth. It is, however, sufficiently plain, and the two central teeth are evidently smaller than their neighbors. A considerable change has also taken place on the surface of the teeth; the two dark marks are rubbed into one in all but the corner teeth.

At ten, the four central incisors are diminished in size, and the mark is becoming smaller and fainter.

At eleven, the six central ones are smaller; and *at twelve*, all of them are very considerably diminished; but not, as we have already observed, to the same extent as in the young beast. The mark is now also faint, or nearly obliterated, except in the corner teeth, and the inside edge is worn down to the gum.

The beast is now getting old; the teeth continue to diminish, and it is not often that the animal, after fourteen or sixteen years old, is able to maintain his full condition. He must then be taken up and partly fed in the stable: yet there are many instances in which favorite bulls have been kept until they were more than twenty years old; and we know a cow of the same age that pastures with the rest of the dairy, and gives a fair quantity of milk."

Beef Production.—The production of beef has become one of the leading agricultural industries of this country. Although it has long been an industry of great magnitude, it has developed to a remarkable degree since the export trade in meats was established. English authorities state that most of the live stock from the United States is superior in quality and condition to that imported from Holland and other parts of Europe, and that there is a juiciness and flavor about the beef, together with a desirable distribution of fat and lean, that are not wholly attainable except through the American system of full grazing. The British farmer, in fattening his beef, is obliged to resort, in a great measure, to cultivated roots, oil cake, and other prepared food; but in this country, which is unexcelled for grazing, there is an abundance of the best grasses and grains, and the "forcing" process in fattening by the free use of the latter, need not be resorted to, except a comparatively short time previous to marketing. The exports in beef and its products alone during the past year were upwards of fifty millions dollars; and when we take into consideration also the vast amount required for home consumption, we shall be able to form something of an estimate of the magnitude of the beef-producing enterprise in this country. The success of beef production

* "We are perfectly aware against what authority we are contending, when we thus compute the age of cattle by the appearance of the teeth. The pleasing author of the 'Illustrations of Natural History,' gives the beast a full mouth at three years old, and so does Buffon, and the editor of the Encyclopedia Metropolitana. Mr. Parkinson says that the mouth is full at four, although he acknowledges that the teeth are not perfectly up until the animal is six years old. We have no hesitation, however, in appealing to the experience of the breeders of cattle for the general accuracy of our account."

depends largely upon the breed and locality. With beef herds, as with those for the dairy, the best for the purpose and locality should be selected. It costs no more to fatten a good animal than a poor one; in fact, it costs less to fatten a well-formed animal that is capable of laying on fat and flesh readily than it does to fatten one that is coarse boned and ill-formed.

It is therefore of the highest importance that a beef animal have the proper form for furnishing the largest possible amount of meat for the "best cuts" at the butcher's block, with the least waste. Beef animals should consequently have large, compact, and block-shaped forms.

Early maturity is also an essential point in the selection of cattle for beef production. There is a great difference in breeds in this respect; some will mature into good beef animals only when five or six years old, while others will be well matured at from three to four years. It requires no argument to show that the latter must be much more profitable than the former for either the grazier or stall feeder, since the sooner the animal is fitted for the market, the less the expense, and consequently the larger the profits. Some farmers seem to regard an ox or cow as such simply, without any regard to characteristics, and we occasionally hear the remark, though not often in this enlightened age, that "one breed is as good as another." If, in the light of all the experience and observation that are attainable on this subject, any individual persists in carrying out in practice what is asserted in the above words, he must expect to take the consequences in little or no profit, as the result of his ignorance and stupid obstinacy. It is highly important that cattle intended for beef, as well as for other purposes, should be *well fed from birth, and kept growing.* A calf that is stunted and starved during the first year of its life will never attain the size of one that is well fed, no matter how generous the feeding may be afterward, neither will it furnish beef of as good quality as the latter. Proper form and size, rapid growth, and early maturity are important items in beef production. Spayed heifers will fatten at two years, and attain large size and heavy weight, but it is a cruel practice, and one that we would not recommend; besides there is danger of losing the animal, spaying not unfrequently being followed by the death of the heifer.

As has been stated in previous pages of this work, the best beef breeds, and consequently the most profitable for beef production, in sections to which they are adapted, are the Short-Horns, Herefords, and Devons, as they seem to combine more than any other, the chief characteristics essential in an animal for this purpose. There are of course other breeds that make excellent beef, and may be profitably used for this purpose, but the above-mentioned are by common consent acknowledged to be most desirable, where beef production alone is the object. What is applicable to these breeds is also applicable to their grades, and the higher the grade the better will the animal be, other conditions being equal.

Feeding Beef Cattle.—It is found that variety in the food of cattle, as well as other domestic animals, is the necessary requirement for the highest success in rearing and fattening them. Although quite good beef may be made from grass-fed animals, where there is an abundance of succulent grasses, yet the best beef is that produced by a mixture of grass and grain. A suitable amount of grain fed in summer in connection with the grass will cause a more rapid growth of the animal, and expedite early fattening when placed in the stall, providing stall-feeding is practiced; or if not, will hasten the fattening process in a corresponding degree, if fitted for market in the field. The addition of a few pounds of corn per day to each steer while at grass would all be utilized in laying on extra fat, and also have a tendency to improve the quality of the beef for fall shipment by giving more solidity to the flesh, hence there would be less shrinkage when weighed by the purchasers.

The English, in feeding Indian corn, give with it from four to eight pounds of oil-cake per head, in order to balance its carbonaceous character with albuminoids. Eight pounds of corn, however, with a dozen or more varieties of grass in pasturage, is a much better food

combination than that of the English. Besides, this small amount of grain with the grass in the warm season will produce a much greater effect in fattening the animal than if fed in cold weather. Grass is good for a basis, but needs the grain in addition to give it staying qualities and so make a complete food combination.

Upon this point a leading authority in this country says: "Another important consideration is seen in the fact that the grain renders the flesh more solid — containing less water or more dry substance — and, in consequence of this condition, steers so fed will lose much less on being taken from pasture for stall feeding in the fall, or for shipment to market. All observing feeders know that steers taken from a good pasture must be fed in stall for some time without much increase in weight, as the sap, or extra water in the carcass is being replaced by fat made from grain, and the steer may be doing well for thirty or more days with but little increase in weight. But when grain is fed with pasture, this shrinkage does not occur on being put up in the fall for stall-feeding. On the same principle, cattle stall-fed through the winter, when taken to good pasture in spring, will increase in weight very rapidly by the addition of sap, or water to the carcass. We have known such steers to gain five pounds per day for fifteen days after being taken to pasture.

We know that some good feeders are averse to feeding grain with pasture, because they think the steers depend too much upon the grain, and do not eat so much grass. But we think their error has been occasioned by not considering the effects of grain feeding upon the quality of the increase in weight. In the West, where corn is cheap, it appears evident to us that a small grain ration with pasture will pay twenty-five per cent. better for the grain than the same amount fed in cold weather."

In out-door fattening, it is a good plan to feed corn in the stalk just as it is cut in the field and stacked. By this means the corn leaves, ears, husks, and stalks are eaten together, forming a more perfect food than corn alone; besides the labor of husking is saved.

Good hay is excellent food for all stock, being nutritious and producing a healthful distention of the stomach, but no animal can fatten on hay alone. A variety of food is best for animals in all conditions. By consulting the table on a previous page, giving the feeding value of different articles of food, average composition, etc., the comparative fattening value of various kinds of food can be determined. Whatever the rations may be for beef animals, they should be supplied with plenty of pure water at all times.

Flavor of Beef.—That the food consumed by animals affects their flesh, is a fact too well authenticated to be denied. We are all familiar with the fact that chopped onions fed to fowl in sufficient quantities will flavor not only the flesh, but the eggs of the fowl that are produced while being thus fed, or shortly after. Pork will take a peculiar flavor from the food upon which the pigs have been fattened, such as acorns and beech nuts. When butchered while feeding upon these nuts, the pork will be oily and have their flavor. If however, such pigs are put in a pen for a few weeks before being butchered, and fed upon corn or other grain, this peculiar flavor will be exterminated, and that of grain-fed pork remains. Fish scraps, and the refuse of the slaughter-house, when used for fattening, give pork a very disagreeable flavor, unless the fattening process is completed by feeding upon corn or other grain.

Water fowls fed upon fish have also the flavor of fish. The flesh of the wild deer has a peculiar piquant flavor, relished by epicures, and which comes from the wild, aromatic herbs on which it subsists in a wild state; but when the wild deer is domesticated, and fed upon cultivated grasses and other kinds of food, its flesh will lose this peculiar flavor in the second generation.

M. Monclar, a French agriculturist of note, after experimenting with different combinations of food, states that any flavor desired can be given to the flesh of cattle, sheep, pigs, and poultry.

He mentions, as the result of his experiments, that poultry fattened upon a small admixture of chopped truffles with other food, will have a finer flavor than those chickens that have been stuffed or larded with truffles preparatory to cooking; the argument being that the truffles eaten by the chickens permeate the whole system, flavoring the meat, which is not the case when they are placed in the dressed carcass of the fowl. He also gives instances in which the flesh of larks shot in a cabbage field, hares killed in a wormwood field, and eggs laid by hens which had eaten diseased silkworms, had such a nauseous taste that no one could eat them; while tame rabbits which are fed upon the waste of anise-seed in barley and bran, and others with the food flavored slightly with the essence of thyme, had a much finer flavored flesh than those fed in the ordinary manner. He found the same true also of ducks and fieldfares which had been feed upon sprigs of juniper.

These facts all prove clearly that the food of all animals permeates the whole system and largely influences the quality of the flesh. This being a fact, it is important that the kind and quality of food given domestic animals that are designed as food for mankind, should receive more careful attention than is sometimes given to this important branch of farming. It also gives the opportunity for testing the skill of the feeder, in furnishing those combinations of food that will produce meats of not only good quality, but of fine flavor.

Marbled Beef.—The best means of producing that quality of meat known as "marbled beef," which is characterized by a desirable mingling of fat and lean, is at present claiming the attention of breeders of stock for beef production and is the subject of much discussion. Some claim this quality to be inherent in the breed; others that it is the result produced by feeding, irrespective of breed. Although some breeds, with suitable feeding, do excel others in this respect, yet it cannot be denied at the same time, that marbling is in a great measure contingent upon the character of the food given. In order to produce the best quality of beef, the food should contain the material for forming flesh, fat, bone, and muscle in proper proportions.

The rations therefore should consist of a variety of food, while the temperature, and the constitution of the animal, should also be considered. No animal that is not mature will marble well with fat. The extensive use of corn for fattening cattle, to the neglect of other food, cannot, in the nature of things, produce the best quality of beef. In such cases there will be a superabundance of fat in large masses, and not that intermingling of fat and lean which is seen in beef of the finest quality. The most successful English breeders claim that the finest quality, as well as the maximum quantity of beef, can be produced only by generous feeding from birth, not only to maturity, but to the butcher's block, while the food should at the same time consist of a variety. Nature has provided for this want in a great measure by the great variety of grasses furnished in our pastures. It is no uncommon thing to find from ten to fifty varieties of grasses growing in our common pastures, while some of our older grazing lands probably contain a hundred or more varieties, thus furnishing a ration to meet the different wants of the system.

Almost every article of food has some quality or combination of qualities in excess of all others, and if the practical feeder will inform himself as to the different kinds of food, he will soon learn to combine them properly in the rations for his stock. Young and tender grass contains a much larger proportion of albuminoids than that which is nearer maturity, and it has consequently been found that cattle will fatten more readily upon grass which is from two to four inches high, than upon that which is of larger growth. Long practice in feeding has established the fact of a certain relation between the amount and quality of food taken, and the gain in the weight of the animal. Dr. J. B. Lawes of Rothamstead, England, found after repeated experiments, that it required from twelve to thirteen pounds of the dry material of food, consisting of grain, roots, and hay, to produce an increase of one pound in live weight on full feed.

All dairymen know that the quality of the milk is dependent in a great measure upon the food provided for the cows, that while some breeds may be pre-eminently dairy breeds, and produce milk of a much richer quality, or more in quantity than some others, yet at the same time the value of any cow for milk production is largely dependent upon the quality and quantity of food given. If milk is dependent upon the food for its quality and flavor, the flesh of the animal must depend upon it fully as much, if not to a greater extent.

If we wish to improve the quality and flavor of the flesh, it can only be accomplished by improving the food and conditions. While much may depend upon the breed, blood does not comprise everything, and the quality of the beef will be found to vary according to the quality and amount of food given. Therefore the feeder's art is of quite as much importance as the breeder's skill, and the two must be combined to produce most economically the best beef.

Nothing is more certain than that the building materials for bone, muscle, and fat, are supplied by the food, for they cannot be created by the animal machine. The animal is simply the mill, and grinds the grist that is given it. Now, if we take Nature for our teacher, and give a proper combination of food, commencing with the young calf and feeding continuously and well (not over-feeding), on a variety of food until the animal is ready for the butcher's block, nicely marbled, first quality of beef, will be the result. Not the best Short-Horn or Hereford in the world, if left to shift for itself until three years old, and then forced into fatness, will or can produce good beef. It is not *breed* alone, but *breed and feed combined* that will result in the first quality of beef production.

Average Age, Weight, and Gain of Beef Cattle Per Day.—The following facts, which were recently obtained from careful experiments by reliable parties in one of the Western States, in feeding cattle of different ages, giving the exact age, weight, and gain of each, will be useful in showing to what an extent the profit of beef production lies in full feeding and early maturity. By consulting the table in which the animals are grouped as near as may be according to age, and observing the average age, weight, and gain per day, the law of growth will be at once apparent. The table is deficient in respect to not showing the amount of food consumed by each animal per day, yet as it stands, is of value in statement as far as it goes.

	Age.	*Weight.*	*Gain per day.*
5 Steers—			
No. 8	585 days.	1240 lbs.	2.11 lbs.
No. 16	612 "	1397 "	2.28 "
No. 17	500 "	1114 "	2.23 "
No. 26	605 "	1196 "	1.97 "
No. 27	544 "	1300 "	1.38 "
Average	569 "	1249 "	2.19 "
5 Steers—			
No. 5	845 "	1636 "	1.93 "
No. 6	814 "	1449 "	1.78 "
No. 7	710 "	1316 "	1.87 "
No. 15	939 "	1474 "	1.57 "
No. 24	982 "	1532 "	1.64 "
Average	848 "	1481 "	1.76 "
6 Steers—			
No. 25	1059 "	1534 "	1.44 "
No. 23	1284 "	1649 "	1.28 "
No. 22	1294 "	1986 "	1.53 "
No. 13	1359 "	1968 "	1.41 "
No. 4	1311 "	2019 "	1.53 "
No. 3	1335 "	2069 "	1.54 "
Average	1240 "	1869 "	1.45 "
4 Steers—			
No. 1	1578 days.	2240 lbs.	1.42 lbs.
No. 2	1593 "	2166 "	1.36 "
No. 14	1420 "	1979 "	1.39 "
No. 21	1573 "	2118 "	1.34 "
Average,	1541 "	2125 "	1.37 "
4 Steers—			
No. 11	1677 "	1930 "	1.15 "
No. 12	1689 "	1974 "	1.17 "
No. 20	1804 "	2134 "	1.18 "
No. 30	1643 "	2820 "	1.71 "
Average	1703 "	2216 "	1.30 "
3 Cows and 2 Steers—			
No. 9	2035 "	1769 "	0.86 "
No. 18	2049 "	1730 "	0.85 "
No. 28	2399 "	2840 "	1.18 "
No. 29	2404 "	2836 "	1.17 "
No. 10	2241 "	1669 "	0.74 "
Average	2225 "	2168 "	0.96 "

It will be observed that the average gain per day decreases as the animals grow older and heavier. The fifth group in the table has the average gain raised by the steer No. 30,

which seems to have been a remarkably fine animal, attaining the weight of 2,820 lbs. at four and a half years of age, and gaining .53 lbs. more per day than either of the others. It is quite probable that the second group were as thrifty and heavy at 569 days old as the first group, or that they weighed on an average 1249 lbs., gaining 2.19 lbs. per day; but in the next 279 days we find that they gain only 232 lbs., or .83 lbs. per day, which is only a little more than one-third of what they gained during the first period. Although the third group of steers were better for their age than the second, yet if we compare them with the first, we find them 671 days older than the latter, and their gain during this time to be 620 lbs., or .92 lbs. per day, which is considerably less than half of the gain of the first period. But this does not show the entire loss of feeding to such an age. If we had the actual weight of food consumed by the steers of the first group in making an average growth of 1,249 lbs., and also the food eaten by the third group reaching the weight of 1,869 lbs., we should doubtless find the live weight of the latter to cost in food from forty to fifty per cent. more than the former; showing that steers not only gain less per day as they grow older, but that they consume more food to make this small gain.

Heavy Weight of Fat Steers. — We have obtained from different sources the following unusual weights of fat steers, which may be of importance as showing what may be accomplished by judicious and skillful feeding. Mr. Geo. Ayrault, of Poughkeepsie, New York, sold a few years since, four steers which were seven-eighths Short-Horn and raised by himself, which weighed respectively, 3,440, 3,406, 3,320, 3,300 pounds each. The age of one of the animals was seven years, and another six. The largest stood nearly six feet high with a girth of ten feet, the proportions of each being good, notwithstanding their enormous size. The aggregate gain in weight during the season was 1,460 lbs. The net beef weight of the larger pair after slaughter was 4,537 lbs. Their average weight at three years was 1,850 lbs. After attaining this age, each animal received daily a peck of corn meal and wheat shorts, or oatmeal combined, divided into two rations followed by a peck of sugar beets twice a day. In summer their only feed was grass supplemented with a little hay. In the second winter the daily rations of meal were increased to ten quarts each, given in two feeds. During their last summer each received a peck of meal per day, given at morning and night, and in the winter following twelve quarts of meal daily in three rations, besides roots. In winter they also had the best of early cut hay from old meadows, and were closely confined, usually having the run of a small yard with access to water, and with sheds under which they could be protected from storms, being tied at feeding time.

The mammoth ox Columbus, seven years of age, is said to have attained the weight of nearly 4,000 lbs. His length from nose to rumps is recorded as eleven feet; girth eleven feet; height five feet, ten inches; horns from tip to tip, three feet and three inches. The Haxton steer is reputed to have weighed 3,452 lbs., while a pair of the Crystal Palace Show cattle dressed 4,100 lbs., one of them netting 2,173 lbs., and lacked but two pounds of making 72½ per cent. of the live weight.

Thatcher's Military Journal of the Revolution, under date of June 24, 1779, contains the following entry: "*No.* 2. I have just had the satisfaction of viewing a venerable large Fat Ox, which has been presented by some gentlemen in Connecticut to His Excellency Gen. Washington. He is 6 feet 7 in. high, and weighs, on the hoof 3,500 lbs.— the largest animal I ever saw."

The steer Gov. Morton is recorded as weighing 3,190 lbs.; Burnside, 2,870 lbs.; Nels. Morris, 2,840 lbs.; a one-year old steer, 1,338 lbs. A three-year old steer owned by J. D. Gillette, recently weighed 2,139 lbs., while three cows owned by other parties are credited to weigh respectively, 1,833 lbs., 2,042 lbs., and 1,936 lbs.

Such records are especially valuable as showing the great weight attained by beef cattle of different ages, and what may be accomplished in this respect. While large size and heavy

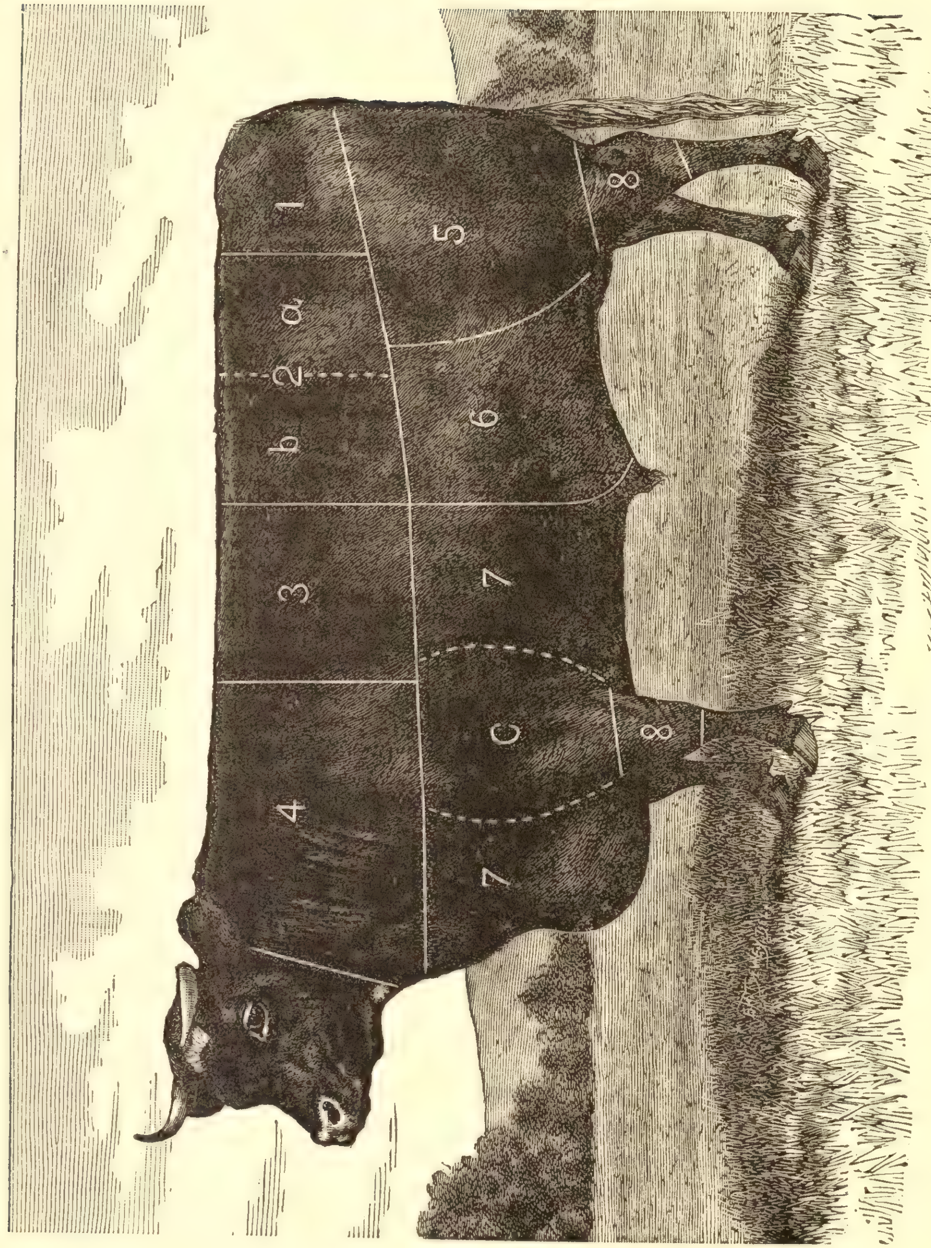


DIAGRAM FOR CUTTING A CARCASS OF BEEF.

weight are to be desired in cattle for the beef market, the quality of the beef produced is a more important consideration, and when that which is first-class in quality is combined with heavy weight in the animal, the breeder and feeder can truly be said to have attained the most economic and successful standard in beef production.

Weighing with a Tape Line.—It is sometimes convenient to be able to estimate the weight of cattle on foot when purchasing, where the means of obtaining the actual weight are not at hand. For doing this, the following method will be found serviceable, although of course only an approximation to the actual weight of cattle can be attained by the use of a tape line. See that the animal stands square, resting equally upon his four feet, then take his circumference just behind the shoulder blade, which is the girth. Then measure from the bone of the tail which plumbs the line with the hinder part of the buttock, directing the string along the back to the forepart of the shoulder blade; this will be the length.

These dimensions will then be used as follows: Assuming the girth of a steer to be six feet four inches, and the length five feet three inches, these multiplied together make thirty-three square superficial feet; and these multiplied by twenty-three (the number of pounds allowed for each superficial foot of cattle measuring less than seven, and more than five feet in girth,) makes 759 pounds. When the animal measures less than nine, and more than seven feet in girth, the rule is to allow thirty-one as the number of pounds for each superficial foot.

When an animal measures less than three feet in girth, the number of pounds allowed in weight for each square foot is eleven; for instance, if a small animal measures two feet in girth, and two feet in length, these two dimensions multiplied together make four square feet, which, multiplied by eleven, gives forty-four pounds as the approximate weight of the animal. When an animal measures less than five feet in girth, and more than three, the number of pounds allowed for each square foot of surface is sixteen. To illustrate, suppose a calf, or sheep to measure four feet six inches in girth, and three feet nine inches in length; these figures multiplied together make sixteen square feet, which multiplied by sixteen (the number of pounds according to the rule, which are allowed to each square foot), gives a weight of 256 pounds. The dimensions of all animals such as cattle, sheep, calves, and hogs can be taken in this manner, and the weight of the four quarters of the animal be very nearly ascertained, sinking the offal. A deduction is usually made for animals that are fat, of one pound in twenty; and for a cow that has had calves, one pound is allowed in addition to the one for not being fat, upon every twenty.

How to Cut Up a Carcass of Beef.—The accompanying diagram illustrates the manner in which a carcass of beef is cut up for the wholesale trade by butchers generally. It is somewhat difficult to show upon a flat surface the exact position of the lines, but to those at all familiar with the anatomy of the ox, the diagram will be sufficiently intelligible.

The parts are named as follows: 1, rump; 2, loin; 3, rib roast; 4, chuck; 5, round; 6, flank; 7, plate (with the dotted line enclosing *c*, the shoulder clod, taken off); 8, shank. The piece 2, the loin, is divided in the meat market into *a* and *b*, as shown by the dotted line in the diagram. From *a* is cut the "sirloin" steak, and from *b* the "porterhouse" steak.

Training Steers.—The best working oxen, and the most easily trained, are those that have been accustomed to be handled from birth, and made gentle by kind treatment. We have seen calves not three months old nearly as well broken as working oxen, and as obedient to every word and motion, the training having been accomplished by a boy who made them his pets, and without whipping or abuse of any kind. By commencing early with calves they can be taught, by kind and patient effort, to perform many things that would seem, from the natural intelligence of the ox, to be entirely beyond his comprehension, all of which shows

to what an extent their powers may be trained to the benefit and aid of man in laboring for him. For instance, oxen may be taught to sit up on their haunches like a dog; to balance each other on the ends of a plank, like children playing "see saw"; to jump over a stick at the word of command; kneel down; walk on their knees; lie down and get up at the signal; jump over a mate that is lying down, etc.

In training for labor, the best plan is to begin with the young calf, before he gets strong, or has learned the extent of his own strength. It may be well first to train each calf to be led by a rope, then with a light yoke of suitable size begin the work of teaching the juvenile pair the things it is desirable for them to know. In a short time, by a few trials accompanied with patience and gentleness, they will have learned the meaning of "whoa," "go on," "haw," and "gee." Do not try to teach them too much at a time, as this is confusing, but be sure they understand the first lesson before proceeding to the second. Teach the meaning of "whoa" first. A sensible, good-tempered boy who knows how to drive oxen can soon instruct the little fellows in all that it is necessary for them to know. Gentleness and kindness should always be the rule in managing such animals.

It will require this course of training for several days in succession, in order to have them understand well what is required of them. And this to be followed by practice every day or two for weeks, in order not to have them forget the lesson. Do not follow the training so long at a time, at first, as to worry them, but commence gradually and increase the time of practice as the training proceeds. The most difficult task of all, is to teach them to "back," as it is an unnatural thing for an animal to walk backward.

This requires much patience and persistence in some cases, and should be accomplished by gentle means, and without a blow from the whip. It must be borne in mind that to go backward is contrary to nature in steer or colt, and therefore the greater need of patient training to accomplish the object in view. Attempt but one thing at a time, and always accompany the word of command with the movement, making the necessary use of such motions with whip or stick as are known to all experienced drivers of oxen. When they have learned to obey all the directions in the yoke, a small cart can be attached (which should of course be very light), and they may be trained to draw it. They should never be allowed, however, to draw anything very heavy, for if overtasked at this age they may be permanently injured.

If steers two or three years old that never have been yoked or accustomed to be handled, are to be trained, it will be necessary to gentle them first by handling, patting them, and feeding from the hand, etc., by so doing quieting their fears of man. Feed and gentle them until they regard their trainer as their friend, and have no fear of him, before attempting to put on the yoke. When yoked, they may be driven with chain between two pairs of old, well-trained oxen. By this means they will become somewhat familiar with the routine of their new sphere of action, and be ready to take a lesson in advance. After driving well between the other oxen, let them next do duty ahead of them as leaders. It would be well to have a rope attached to the horns of the "near" steer, which the driver may make vigorous use of in teaching the steers the meaning of "whoa," "haw," etc. They may be taught to back by commencing with an empty cart on a slight descent, which will make it easy for them, afterward on level ground, or up hill until they will learn to back a heavy load. Always be sure that the yoke is made to set easy, and the bows well adjusted to the neck.

Young steers should not be expected to do hard work, and should never be put to it until at least four years old. Even when well trained, be in no haste to put them to the plow or cart, for this is severe work, and should be performed by older oxen. Overworking young steers has injured for life many valuable animals, with a consequent loss to the owner. When worked in a storm, cattle are liable to have sore necks. This may be prevented by

rubbing the parts with fresh lard or sweet oil where the yoke chafes. Never work an ox or a horse with a sore neck, but allow the animal rest until the sore is perfectly healed. Never shout at oxen as though they were deaf and it required the utmost power of the lungs to make them hear. It is amusing to see some farmers drive their oxen. We have seen drivers where the wonder was that they did not tire themselves out by their shouts and gestures, for they appeared to work harder in driving the team than the oxen did in drawing the load. Low, quiet tones are better than loud ones, at all times in securing the best results in drawing.

A Mr. White of Canada, who gained considerable celebrity in training oxen a few years since, and who trained a pair that were for some time on exhibition through the country, says respecting his method:

"The first thing necessary in training oxen is kindness, then patience. I began in November last, not knowing whether I could get my oxen taught in time for this season or at all, but I soon found them so tractable that my hopes began to be raised. It took me just a day to learn that it wasn't necessary to strike a blow or speak a word. The farmers who go along shouting at their oxen and goading them waste their breath and strength. A dozen yoke of oxen could be taught to draw a load a hundred miles without a word or blow. It is only necessary that the farmer should lead to show the direction, and the beasts, if they have been kindly treated and have an affection for their master, will do the rest. These oxen were trained by uniform kindness. A series of tricks in regular order was fixed upon, and I put them through every day. I was with them nearly all the time, and they followed me like two pet kittens. There was a ring in the stables where I taught them day by day. First, with food in my hands I got them to follow me around the ring in any direction I chose to take. In this way I got them to go along on their knees, and to waltz. What they knew when I got them had practically to be untaught, as it was all done by 'gee' and 'haw.' I found that they were quick of sight, and that, having taught them certain things, I needed after that to simply get where they could see me, and give them a cue by the motion of my body or my whip in a certain direction. In this way the waltz was taught, and when they go around the ring on their knees I keep ahead of them and they follow me."

Never load working oxen too heavily; if you do they will not have courage to take hold readily with energy when called upon by the driver. Never dull and discourage them with prolonged exertion with impossibilities. They should be generally fed with good hay and grain when on active duty, and always at regular intervals, morning, noon, and night. Great and permanent injury is the frequent result of light feeding, combined with the heavy work too often exacted from these patient and uncomplaining servants of man. Strength and spirit rapidly decline under the overworked, straining system, and soon nothing remains but a stupid, moping brute. The whip is needed to indicate the precise movement desired, and not—except in very rare instances—as a stimulant or means of punishment. Oxen cannot endure the heat as well as horses, and are liable to be overheated in the spring and hot summer weather. When once injured in this way, they rarely ever fully recover from the effects. Oxen should be groomed and well cared for, and their stables kept clean and comfortable. The ox is considered in his prime at five or six years of age, and continues to be equally useful until about nine or ten years old, but is seldom as active after the eighth year. It is generally considered better to fatten oxen at or before arriving at that age, and have younger ones take their places in the yoke.

Cattle Herding, etc.—It is probable that few persons outside the great cattle herding region of the Northwest have any definite idea of the vast numbers of cattle raised there, or the enormous amount of capital invested in stock not confined within the boundaries of farms, but which are herded summer and winter, subsisting upon the grasses and herbage of the extensive grazing lands of these plains. It is estimated that the almost boundless grazing

grounds of the United States contain 1,650,000 square miles, with over a billion acres, and quite a large portion of these lands is being utilized for herding cattle. The quaint, bony, and half-wild descendants of the original Spanish cattle soon overran the fertile plains of Texas and New Mexico, spreading northward to Kansas and the Indian territory. Immense herds of these cattle were formerly driven north into Kansas, where they were herded during the grazing season, and taken from thence to States farther eastward to be fattened in winter, or sold directly to the butcher. At a period still later the plains of Nebraska, Colorado, Montana, and Wyoming have been used as herding grounds for cattle descended from the Spanish or Texan stock, but improved upon by crossing with the Short-Horn and Hereford breeds, such crossing having wonderfully changed the original characteristics of these breeds. In California these Spanish cattle, which were formerly extensively herded there, have given place to improved breeds. Considerable attention is also paid to the transportation and acclimating of well-bred northern cattle into Texas for improving the herds there.

To illustrate what one man has accomplished in cattle herding, we give a brief mention of one of the pioneers in this business in Colorado, Mr. I. W. Iliff, commonly known as the "Cattle-king of the Plains," who owned at the time of his death the largest range in the United States. This gentleman was born in Zanesville, Ohio, and entered the business about seventeen years previous to his death, on a small capital, and, by constant accessions of land, finally owned a tract a hundred and fifty miles long, and a herd of cattle numbering 46,000. This ranch was located in Northern Colorado, extending from Julesburgh, on the Union Pacific Railroad, to Greeley, a hundred and fifty-six miles west, its southern boundary being the South Platte River; its northern a rocky bluff south of Lodge Pole Creek, making it nearly in the form of a right-angle triangle.

The range was divided into thirteen ranches. At each ranch were quarters for a portion of the forty-six men who take care of the entire range, and corrals where the stock was gathered to be branded, and where the horses were kept in winter. The Union Pacific road took out $18,000 worth of supplies every year, and brought away from 12,000 to 14,000 head of cattle every season, valued at $26 per head. At the time of the death of Mr. Iliff he had 46,000 head of cattle on the range. The average number of calves was 4,500 a year. The herds require but little care, but graze their own food the year round. When the weather was inclement they sought shelter in Chalk Bluffs, or some of the woody retreats. Generally the grass is sufficient the year round, and it is the best for food when dried. Water is plentifully supplied by Platte River, the Crow, and Little Crow. In severe winters like the last, many cattle die, but the average loss is less than 7½ per cent.

Mr. Iliff took pains to improve the breed of his stock, and his brand, which consisted of a monogram of his initials, was well known in Europe, whence a great deal of his stock, consisting of Herefords, Utahs, and Short-Horns, was shipped. During the seven years of his ownership of this range, Mr. Iliff shipped over 200,000 head of cattle to the East. Some of these were sent to New York and Philadelphia as an experiment, but the market finally settled in Chicago, 700 miles distant. Mr. Iliff considered it a poor success if in any year he did not ship 12,000 or 14,000 head of cattle from his ranch.

Essentials in Cattle Herding.—As generally managed, little or no provision is made for feeding in winter during extended drouths in some sections or severe storms in others; hence, great loss has been sustained by vast numbers dying from lack of food and exposure, deep snows and severe weather occasionally being encountered in the more northern of the grazing regions. Immense losses were sustained during the winter of 1881 and 1883 from the latter cause, which might have been obviated by a little forethought in providing hay for feeding, and also shelter during such storms. There should also be free access to water for the herd, and a plenty of range accessible to it.

In many portions running streams are rare, and the country is subject to extreme drouth;

where such conditions exist, recourse must be had to supplying water by Artesian wells, or by wells from which a supply of water can be forced by some mechanical means, into pools and tanks, such as the wind-mill for instance. Tanks or pools may be made in the ground for this purpose by thorough puddling, and grouting the bottom so as to prevent leakage. Such a pond must be sufficiently deep to counteract loss by evaporation. Cattle do not wander far from the feeding grounds. In this respect they differ greatly from buffalos and wild horses, and will die from want of water if it is not supplied, as they will not wander far in search of it. A cattle range cannot therefore extend farther than about five miles from permanent streams, unless water be supplied by wells.

There should be means provided for the sheltering of stock during storms. Where there are glouches, these may serve as a kind of protection, but where there are none, the best-protected locality should be selected and planted with timber, that is adapted to the soil. The Norway spruce and yellow pine will thrive in a dry soil, while the cotton wood, catalpa, and other varieties will grow well where there is sufficient moisture for grass to grow. Such a bed of trees must however be protected from the trampling of the cattle until grown to a sufficient size not to be injured in this manner. The above varieties of trees are quite hardy and will grow rapidly in soil to which they are adapted. The Indians were formerly quite troublesome to cattle herders, by their depredations, but within a few years, since being confined mainly to their reservations, this trouble has for the most part ceased.

Habits of Prairie Cattle.—General Brisbin, in his little volume entitled "The Beef Bonanza," has given the following concerning the habits of prairie cattle, when herded in large numbers: "I visited the herds of the Plattes and made careful inquiry as to the number of cattle, names of owners, and profits to be derived from cattle-breeding.

On the Laramie plains I saw the finest cattle, and one herd in particular pleased me, a drove of 1,500 cows, with 2,300 calves of various ages. First we came upon a few stragglers, or warders, guarding the herd, who seemed to be sentinels over the calves. Next we found families of two, four, and six, in groups, then bunches of a dozen, and lastly the great body of the herd. The cows were Texas, bred to large Durham bulls, and the calves bore strongly the impress of the male. Nearly all had thick necks, sturdy bodies, and seemed very healthy. I saw one enormous bull, and near him a cow with three calves, one a two-year-old, one a yearling, and one about two weeks old. It was a grand sight, this herd of 1,500 cows, 50 bulls, and 2,300 calves. They were much scattered, covering the prairie for miles, and seemed an endless mass of beef for one man to possess; yet I was told that the gentleman who owned this herd had three larger ones. I saw a little calf just taking his first steps on the prairie, and stopped to observe him. The cow ran away at my approach, but immediately came back and stood resolutely and defiantly by her young; indeed, so wicked did she look, that the driver whipped up his horses and got away as soon as possible. These Texas cows are dangerous if approached too closely, and, from the fire in the beast's eyes, I am sure she was going to charge.

It is a study to observe the habits of the prairie cattle. They run in families like buffalo, the cows keeping their calves with them sometimes until they are three or four years old. It frequently happens that the mother has under her protection sons and daughters larger than herself. The cow watches over her offspring, and when they disobey punishes them with her horns, to which they tamely submit, like well-trained children. In the middle of the day the cattle leave the high grounds and go to the river bottoms for water, and about nightfall return to the high grounds. In traveling back and forth to the water they march in single file, using the same paths as the buffalo, and, like them, wear deep ruts in the earth. The cattle frequently go four and five miles to water, but, having slaked their thirst, nearly always return to the same ground from which they started out."

Description of a Cattle Ranch.—The following interesting description of cattle herding is from the pen of a practical herder in Kansas:

"It is the early dawn of a May day in western Kansas. A sea of rolling billows of land extends in every direction to the utmost reach of the vision. The plains are covered with a rich growth of blue joint and buffalo grass. A herd of cattle is sleeping in the corral by the creek—cows, two-year-olds, yearlings, and calves. A few ponies are picketed with long ropes on the prairie. A couple of saddles, blankets, and bridles hang on pegs by the corral bars. The scene is eminently peaceful. Occasionally a cow rises, and walking to the salt barrel gently licks the salt, then licks her nose, as though she had serious thoughts of pickling it, so as to insure its keeping over summer. But on reflection she concludes it will keep this season at any rate, and walks over to the stretching posts and there stands rubbing her neck up and down.

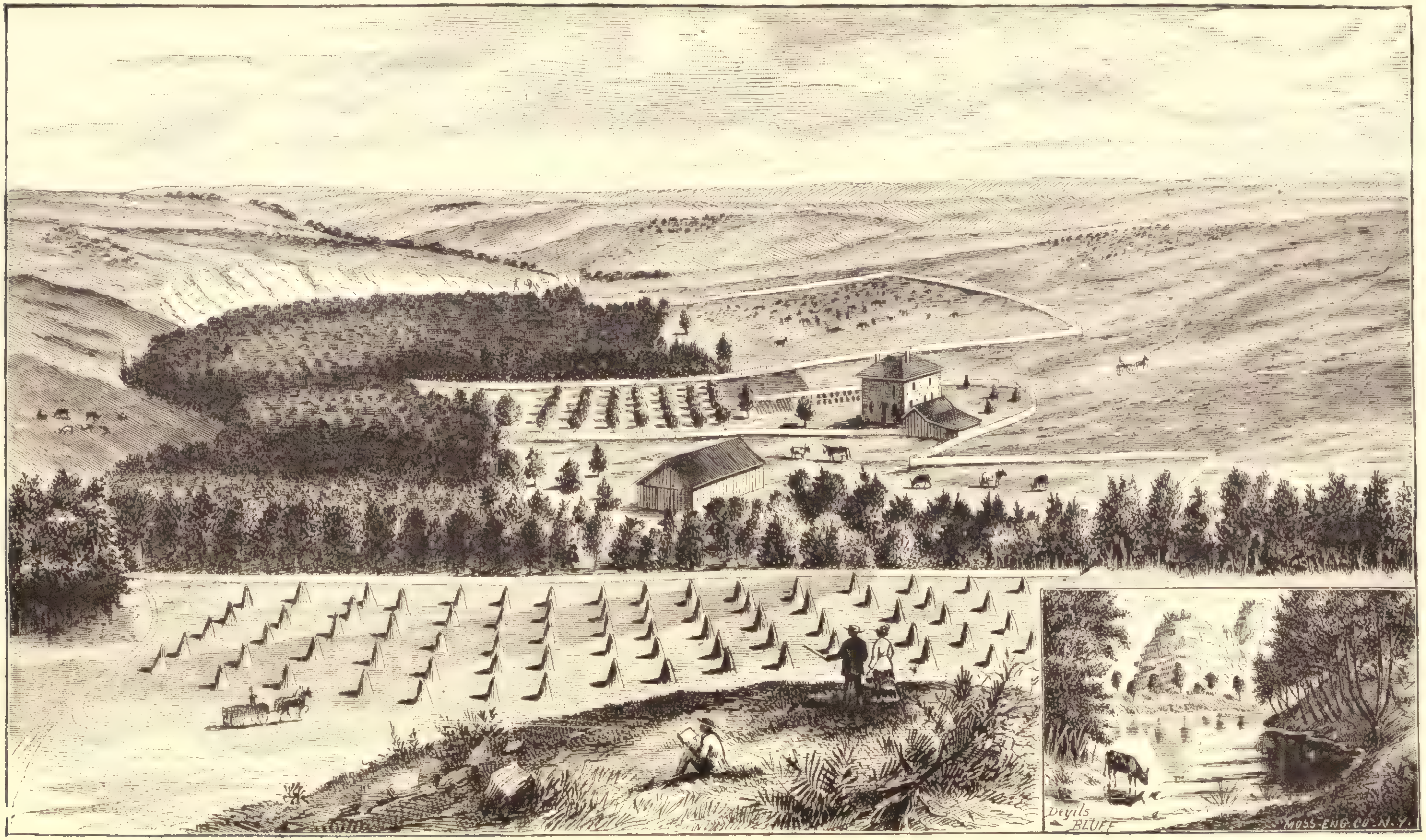
Suddenly stopping she gazes, open-eyed, at a wolf, who sits on her haunches some hundred yards from the corral, sitting there pensively, looking at the great amount of fresh meat. After gazing at the wolf until satisfied, the cow lies down again. The deep breathing of the cattle, the morning calls of the meadow larks, the soft music of the wind as it whistles through the short, tender grass, are the only sounds heard. As the east grows red, the occupants of a large dug-out, situated by the bank of a creek, lounge slowly out, and walk to the water, where they drink and wash—the latter is a speedy operation, as the herder does not waste time in washing. One goes to feed the ponies corn and saddle them, the other builds a fire and cooks the breakfast. This meal consists of corn-dodgers, or baking-powder biscuit, fried bacon, and strong coffee without milk or sugar. There may be 200 cows in the herd, but none are milked.

The herders simply exist with as little trouble as possible. As a rule, they do not read, do not think of anything but the cattle. To attend these well is their ambition. After breakfast the bars are taken down, and the cattle string slowly out of the corral. Forming in long lines, they follow the deep, well-worn trails that lead to the feeding grounds. It is a very leisurely march. Now and then an animal drops out of the file, eats a few mouthfuls of grass, but soon drops into file again and resumes marching. On reaching the desired feeding ground, the cattle spread and begin feeding. At about ten o'clock they are full, or nearly so; and, in a listless manner, they change front and feed toward the water. Arriving there, the herd drink, stand in the water, and so 'loaf' away an hour. They then lie down, and for two or three hours remain quiet. As the sun gets low, the cattle again spread and feed. As the sun sinks to the horizon, the herders slowly force them to feed toward their corral, and by the time they have fed up to it it is generally dusk. Bars are put up, ponies staked out, supper cooked and eaten, and the herders go to bed.

In all herds there are a few animals that lead off; that is, they will not remain on your range, but constantly endeavor to lead the herd to pastures new. These animals are generally yellow or black steers; but sometimes cows and heifers are guilty of the trick. Of course, these animals are sold as soon as possible; but, until sold, they are the cause of a vast amount of hard riding.

The cattle of Texas are not afraid of a man, nor are they afraid of a horse; but they are afraid of a man on a horse. They do not understand, at least do not seem to understand, that a man on horseback is a combination of animals. Apparently they regard the two as one animal, and one that is too powerful for them. To get off a horse in a herd of wild Texas cattle is almost worth a man's life, and an experienced herder will never do it.

All herds of cattle have a bully among them. There is a boss cow, and she is hated and feared. Of ugly disposition, constantly hooking unoffending cows, greedy in eating, she makes herself generally disagreeable. Or it may be that the bully is a steer; the characteristics of the brute are all the same. The rest of the herd are all afraid of her or



CATTLE RANCH
Owned by Messrs. Makin Bros., near Florence, Kansas.

him. Singly they can do nothing. Matters go from bad to worse, and cow life becomes almost unendurable in the herd. Something has to be done, and that soon. The bully in walking along gives some unoffending cow a sharp thrust in the ribs. Instead of running off, as expected, the stricken cow wheels around, fury in her eyes, and, bellowing a war cry, dashes head on for the bully. The boss is surprised, but gets to work as an expert, and the rebellious cow is being rapidly whipped (these cattle fence with their horns); but the cry for liberty is understood by the rest of the herd, and with an unanimous movement they all turn on the tyrant, and if the herders do not interfere, they kill him.

The bully, being whipped, turns to run, and to his horror finds that the whole herd is after him. As one animal gets near him, he receives a vicious dig from a sharp horn. He increases his speed, but soon another animal comes up to him, and another stab is the result. The bully, with extended tongue and labored breathing, is leading the herd, and the herd, with extended tongues and upright tails, are following—steers, cows, calves, all bellowing loudly, 'Kill him! kill him!' And kill him they will, if the herders do not stop the pursuit.

After a lesson of this kind the bully is a marvel of gentleness and consideration. A calf could whip him. Once I left my herd for an hour. On my return I was surprised to find the cattle bunched around a deep pool in the ravine. They were evidently greatly excited; the constant bellowing, the lashing of their tails, their craned necks as they looked over the banks of the pond, all indicated that something was wrong. Running my horse and swinging a heavy whip, I was soon among the cattle. They gave way for me. I rode up to the pool. There, standing in deep water, was the bully, a ring of excited steers and cows standing around him, but unable to reach him. I put a stop to the fun, and left the bully in the water to cool off. I did not see him for a week. Then he joined the herd a private.

If an animal in the herd gets badly wounded, it will be killed by the others if great care is not exercised. The sound animals turn ruthlessly on the sick or wounded ones.

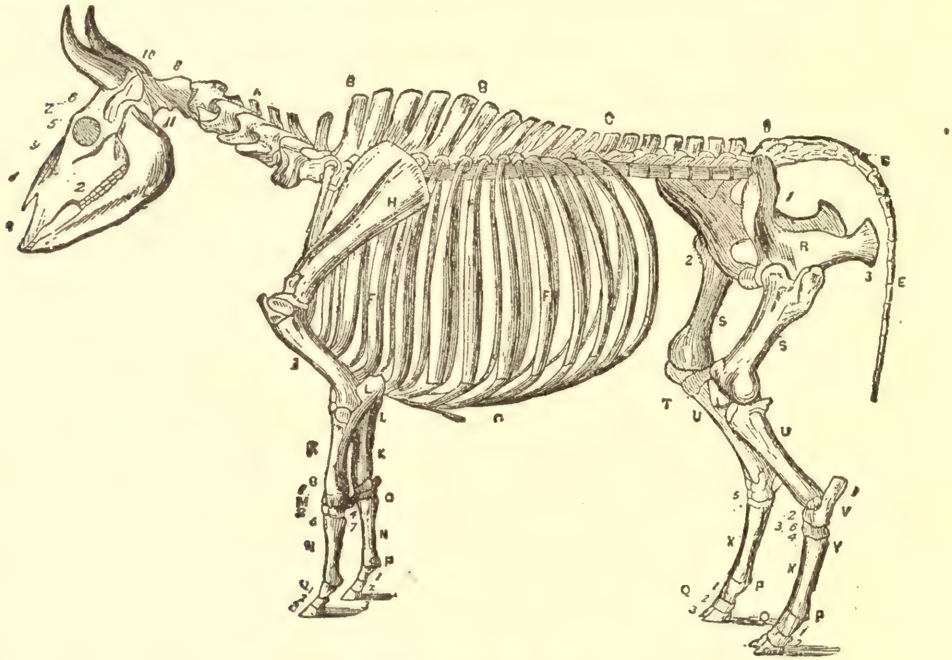
It looks hard, and the unthinking observer remarks on the cruelty shown toward one another by dumb animals. It is simply an expression of the instinct of the animals, by which they expect to ward off attacks of wolves, and to prevent their prowling about the herd by removing the inducement to it. The animal is wounded, badly wounded; the wolves smell him, and, from far and near, gather about him. The cattle, in their wild state, constantly moved up and down the water courses; so when they killed the sick animal, they left the body behind. Now they kill the sick one for the same reason, and daily feed about his carcass.

In July the herd is fat; calves are doing well and are full of play; grass is plenty, and the herd, as a whole, feel splendidly. They are easily amused, too. Jack rabbits are plenty in Kansas, and are a never-failing source of amusement to the cattle. Accustomed to the rabbits from their calfhood up, it is simply absurd to see the actions of the animals. A calf finds a big jack rabbit, and, very naturally, is interested in looking at this wild beast. Cautiously approaching him, she gazes open-eyed at the small monster. Another calf joins her, and they each regard the animal. Beginning to caper about it, the attention of the herd is attracted, and they all come up to have a look at the jack. He is made to get up and jump quaintly off. The cattle all follow; the rabbit sits down, again to be forced up; and when he again jumps off they caper around him, or, with pretended alarm, they bellow and run away.

Many men who came to Kansas in 1869 went into the cattle business, bringing Eastern ideas with them. They very naturally built sheds to protect their cattle from the cold storms of the winter. I did this, and made a mistake. The reason why sheds are not good is, that the cattle stand under them when the cold winds blow, and refuse to leave the shelter to feed or drink; and when weakened by this lack of food they lose vitality, and huddle

together for warmth. This huddling is very dangerous; the outside cattle want to be on the inside, and they pile up on each other. This piling is called 'stacking,' and when once begun, some cattle are sure to lose their lives. Out of one 'stack' I took twelve dead steers one morning. A neighbor of mine took thirty-six dead beeves out of one 'stack.' After losing the twelve steers I took down my sheds, and that ended the trouble."

Skeleton of the Ox.—The following shows the scientific names of the bones in the skeleton of the ox, together with their location.



SKELETON OF THE OX.

A—Cervical Vertebræ. *B B*—Dorsal Vertebræ. *C*—Lumbar Vertebræ. *D*—Sacrum. *E E*—Coccygeal Bones. *F F*—Ribs. *G*—Costal Cartilages. *H*—Scapula. *I*—Humerus. *K K*—Radius. *L*—Ulna. *M*—Carpus or Knee. 1—Scaphoid. 2—Semilunar. 3—Cuniform. 4—Trapezium. 5—Trapezoid. 6—Os Magnum. 7—Unciform. 8—Pisiform. *N N*—Large Metacarpal or Cannon. *O*—Small Metacarpal. *P P*—Sesamoid Bones. *Q Q*—Phalanges. 1—Os Suffraginis or Pastern Bone. 2—Os Coronæ. 3—Os Pedis. *R*—Pelvis. 1—Illium. 2—Pubis. 3—Ischium. *S*—Femur. *T*—Patella. *U*—Tibia. *V*—Fibula. *W*—Hocks. 1—Os Calsis. 2—Ostragalus. 3—Ostragalus. 4—Cuniform Medium. 5—Cuniform Parvum. 6—Cuboid. *X*—Large Metatarsal. 1, 2, 3—Phalanges. *Y*—Small Metatarsal. *Z*—Head. 1—Inferior Maxilla. 2—Superior Maxilla. 3—Anterior Maxilla. 4—Nasal Bone. 5—Molar. 6—Frontal. 7—Parietal. 8—Occipital. 9—Lachrymal. 10—Squamous. 11—Petrous.

The Pulse, Respiration, etc.—The pulse in cattle generally ranges from forty-eight to fifty-five beats per minute in the mature ox. In cows it is generally somewhat quicker, especially near the time of calving. In calves, as with all young animals, the pulse is considerably faster than this, according to the age. The condition of the pulse may be readily ascertained from the artery passing over the jaw bone directly at the cheek part of the lower jaw, to ramify on the face; also over the middle of the first rib, and that beneath the tail. A quickened pulse denotes a feverish state or inflammation, while a slower pulse than is natural indicates debility of some kind. The pulse of cattle, when in a perfectly healthy state, is softer and less strong than it is in the horse under similar conditions.

In cattle the number of respirations per minute is from ten to fifteen; these respira-

tions are always accompanied by a soft rustling sound caused by the air rushing through the air cells of the lungs, which may be distinctly heard by placing the ear to the chest of the animal. A change caused by any inflammation or disease of the lungs or air passages can readily be detected by the sound of respiration.

The temperature of the body can be determined with considerable accuracy by feeling the horns at their roots, the skin, ears, and legs. When the exact temperature is desired, a clinical thermometer is used, which is a thermometer so formed that its bulb can be inserted in the rectum of the animal, where, after remaining three or four minutes, the exact temperature will be indicated. The use of this instrument has established several important facts relative to diseases in connection with the temperature, viz., that different diseases have different ranges of temperature beyond which recovery is impossible; for instance, it has been ascertained that a horse may recover in case of pneumonia, at or even beyond a temperature of 109°; but with cerebro-spinal meningitis, the disease has always been found to prove fatal soon after reaching a temperature of 104°.

General Indications of Disease in Cattle.—The coat of an animal is a good indication of the state of health. What is termed a "staring coat," or a coat in which the hairs stand out straight from the skin, is a symptom of a low condition of health. Isolation from the rest of the herd, the ceasing to chew the cud, shivering at slight exposure to cold, or to none at all, generally indicate an attack of some disease. The peculiar position when standing, the manner of lying down, getting up, or of moving about are also significant. The muzzle of the healthy ox or cow is moist, or covered with beaded drops. In disease, and more especially in fever, it becomes either hot and dry or unnaturally cold, and sometimes changes to a pale shade in color; but more frequently it becomes overcharged with blood. In cows a low condition or attack of disease is also usually accompanied with a drying up of the milk.

DISEASES OF CATTLE.

WHEN properly managed, cattle are not subject to many diseases. A few things are essential to the perfect health of any animal, and these may be comprised in a sufficient supply of pure air, pure water, nutritious food, and shelter from the inclemency of the weather. If, when stabled, proper attention be paid to ventilation, cleanliness, and warmth, with a liberal supply of pure water, proper food, and a frequent but gradual change of diet, there will be but few, if any, derangements of the system which nature will not remedy far better than nostrums or drugs of any kind. Cattle that are neglected and kept in a half-starved condition, or those that are managed according to an extremely opposite method, being pampered and forced with a surplus of highly stimulating food, are much more liable to disease than those that are well fed and judiciously managed.

Common sense is fully as requisite in the treatment of stock as in the management of any other department of the farmer's avocation, and if good judgment be exercised in the use of *preventive* measures, there will be but rare necessity of resorting to the curative properties of remedies, since the large majority of diseases are caused by improper management, or want of care. Prevention of disease is in all cases much more easy, and attended with less trouble and expense than the curing process; in fact there are some diseases that can only be successfully treated by an educated veterinarian. The farmer who doses and drugs his cattle for every slight or imaginary ailment commits a great error, and will be liable to bring on more difficulties than he relieves. In all cases the symptoms should be

carefully studied, and the real nature of the disease ascertained before resorting to any remedy. The common diseases of cattle that are most to be dreaded are perhaps garget, puerperal or milk fever, and idiopathic or common fever.

Fortunately for the present age and the races of cattle generally, the number of ignorant quacks who resort to bleeding, boring into the horns, cutting off or splitting of the tail, and other equally barbarous practices, is much smaller than formerly, and is gradually being reduced, while those who resort to a common sense and humane method of treatment, are taking their places.

The "heroic treatment," however, still prevails quite too extensively with herdsmen, as well as those having the care of other domestic animals, and is quite as likely to kill as it is to cure.

Prescriptions for such supposed and ridiculous maladies as "tail ail," "hollow tail," "horn ail," and "wolf in the tail," will not be found in this work; for the treatment of imaginary evils with torturing remedies is not only needless, but as absurd as it is cruel, and is the result of ignorance and superstition. The remedies that have been recommended for these supposed diseases are often as ridiculous as they are strong and pungent in their nature; for instance, the former popular remedy for the above supposed diseases of the tail, as is well known, was first to split the end of the tail five or six inches, and supplement this by putting on a quantity of red pepper and salt, after which the tail was wrapped in a cloth and tied up. In the same connection with the former, a pint of spirits of turpentine was frequently rubbed into the skin on the back of the animal from head to tail. If the poor beast lived through these tortures, the sage doctor considered it a remarkable cure, and an additional proof of his wisdom and skill! If the tail is soft and full at the end, it is owing to an effusion, the result of a disordered condition of the animal system, instead of a disease of the tail.

With regard to "hollow horn," we would say that the horns of all cattle after three years of age, are hollow at or near where they are attached to the head; the hollow increasing with the age of the animal; the only exception being with bulls or those cattle with very short stubby horns. The coldness or heat of the horns, as the case may be, is only an indication of the condition of the general system, and not of a disease of the horns.

Many valuable animals are lost through the treatment of ignorant quacks or those who follow their teachings, in the treatment of real or imaginary diseases. Some judgment, or what might be termed practical common sense, is particularly essential in the management of stock, and when this is exercised, but few remedies will be required to maintain a general sanitary condition among cattle, or any of the other farm animals. In most diseases there is a natural tendency to recovery, and in the majority of cases the animal will recover if allowed a fair chance. There is no doubt that many animals are doctored to death, when if left to nature, they would have gone safely through. Good care and tender nursing are better than medicine, and to all having charge of animals we would say, nurse well, give good care, but dose sparingly; rather let an animal take his chances of recovery or dying a natural death, than of killing him with powerful nostrums.

We give in this connection some of the more common diseases of cattle and accidents to which they are incident, with remedies for the same, which department has been carefully prepared by consulting the best European and American authorities on the subject, as well as from personal experience and observation.

The cause of diseases and their prevention will be found to have received considerable attention, these being regarded as of primary importance, since it is much better in all respects to prevent the evil in the first place, than to eradicate it when once developed.

Abortion. — Abortion, or the slinking of calves by cows, is a source of serious loss to many farmers and dairymen, and is liable to occur at almost every month of gestation, but

more particularly from the sixth to the ninth month. The application of the term abortion is generally restricted to those cases of miscarriage which take place at such an early period of gestation that the foetus could not survive, while cases that occur later, when the offspring is so completely formed as to be able to maintain an independent existence, are generally denominated *premature birth.*

The average period of pregnancy in the cow is about 284 days, and any cause that will have a tendency to sever the foetal connection much before this time may be regarded as an injury, since it disturbs and arrests in a measure the development and tranquility of the young animal in the last stages of its uterine life, and everything that may have a tendency to bring about this condition of severing the relationship existing between the dam and offspring should be avoided. In the breeding of choice stock the loss of the calf is no small item, while in some cases the cow either dies, or is rendered practically useless, remaining for a long time in a feeble and sickly condition, and can neither be fattened nor made useful in supplying milk. In rare instances we have known cows that have aborted to continue in milk, but the milk was poor in quality and small in quantity. Cows are more liable to abort than any other animal. As a rule, a cow that has once lost her calf will never afterwards be a safe breeder, but will be liable to the same trouble again, while her presence in the herd is a source of danger to others.

It not unfrequently happens that unless precautionary measures are taken, abortion will spread through an entire herd, although it cannot be properly regarded as contagious. Cases are on record where fully twenty-five per cent. of a herd of cows have aborted in a single year, and from no clearly ascertained cause. Whenever there is the least indication of this evil making its appearance in a herd, the greatest caution should be used to prevent its increase. The cow that is affected should be immediately excluded from all the others. The sight or smell of the foetus or after-birth might produce such an excitement as to cause other cows to abort, consequently great care should be exercised in this respect, and both be deeply buried. The stable in which the affected cow has been confined should also be thoroughly disinfected before being occupied by another animal. There may be, however, some local cause for the evil to which the entire herd are exposed, and this must be removed before the difficulty will cease.

Principal Causes of Abortion.—Anything that will have a tendency to excite or disturb the intimate relationship existing between the mother and offspring, such as fright, injuries received, or violent exertion, will be liable to cause abortion. Pregnant cows should, therefore, be treated gently and kept as quiet and contented as possible. They should never be treated harshly in any respect. Never permit a brutal man or boy to abuse them with whip or voice. Great injury is often done by the employment of careless boys to drive the cows, and the free use of the whip. Cows that are soon to come in should never be driven out of a walk, over rough roads, worried by dogs, forced to climb steep hills, or jump over bars, as is too frequently the case, when indifferent and incompetent help is employed on the farm. It sometimes happens that the slant of the stable floor may be such as to produce a constant strain on the body, and cause abortion. Lack of cleanliness, and insufficient bedding will frequently be found to be the cause of the difficulty. Cows that are compelled to lie upon a cold, damp, stable floor night after night, with no bedding for protection, cannot be comfortable. Everything that has a tendency toward unsanitary conditions, or discomfort, will be liable to do harm to a breeding animal.

Want of sufficient food will not unfrequently cause abortion. Although the foetus derives its nourishment from the mother, and grows at her expense, an ill-fed cow may possibly produce a calf that has not suffered sufficient privation in its natural nutriment to cause any serious injury to the latter, yet a pregnant cow, kept in a half-starved, weakened, and emaciated condition, would be very susceptible to unfavorable influences and be more

liable to abort from slight causes than a well-fed, vigorous animal that received proper care in every respect. Abortion may also be the result of injudicious feeding in many respects. An able authority on this subject says:

"A coming-in cow that has overeaten of dry meal, and has *impaction of the manifolds*, is quite liable to abort, if she survives. A severe case of hoven, also, during the last months of pregnancy, is almost sure to be followed by a miscarriage, on account of the pressure and mechanical disturbance that the womb receives. In fact, the sympathetic connections between this important generative organ and the intestinal track are so intimately blended, that very laxative and irritating food is often followed by serious consequences in the pregnant female. Rye bran and potatoes, when fed in large quantities to a cow, at almost any stage of gestation, often give rise to such a copious diarrhœa, especially if she has plenty of cold water to drink, that the uterine cavity becomes involved, and thus its living contents expelled.

The condition of forage should never escape the dairyman's or breeder's attention. Much harm has been done in feeding musty hay and fermented meal, as well as the ergotized grains, to pregnant animals. The first is a very deleterious article, and never should be fed to any kind of stock, on account of its great tendency to constipate the bowels, and thus bring on a type of disease not easily controlled. The various kinds of feeding mixtures that have been 'heat,' and are undergoing putrefactive changes, are not only quite worthless, many times, in a nutritive point of view, but absolutely dangerous to be used. A full meal of such a damaged article of food is liable to overcome the action of the gastric juice, and consequently bring on a case of hoven, or *tympo-enteritis*, which invariably compromises the safety of the unborn progeny.

The effect of ergot, or *spurred* rye, upon the muscular fibres of the womb is so powerful in causing contraction of that organ, that physicians have used this peculiar *fungus* for more than half a century as an article of medicine in obstetric practice. Several species of fungoid parasites, closely allied to this medicinal one, which is botanically known as the *Secale cornutum*, are found growing upon the other cereals and the various grasses. These fungi grow much more extensively and luxuriantly upon the moist fields and during the wet seasons. The quantity of this *poisonous* substance, therefore, that cattle are liable occasionally to consume, either while at pasture, or in the barn during the winter, will be found to be quite variable in different localities."

Abortion is not unfrequently occasioned by pampering the animal with highly stimulating food in hot stables; slipping in the stall or on the frozen ground, annoyance from the bull or others of the herd, purging, the drinking of impure water from stagnant ponds, etc.; in fact, the more quiet you can keep breeding cows, and the nearest approach to perfection in the sanitary conditions and general management that can be attained, the less danger will there be of trouble in this respect, and the better it will be for the offspring.

Symptoms of Abortion.—The first symptoms of abortion are generally a loss of appetite; the animal will cease to chew her cud, seem listless and dull, separates herself from the rest of the herd, and is inclined to lie down, with a disinclination to get up; the milk diminishes in quantity, and sometimes dries up. After a time she will grow restless, and there will be a watery discharge from the vagina, followed a little later by discharge of the foetus. If the abortion occurs later in the period of gestation, the animal will sometimes show great distress until the foetus is discharged, and it is often in such cases in a partially decomposed condition, showing that it has been dead for several days. This will be sometimes followed by the discharge of the after-birth, but it usually becomes decomposed and drops away in fragments, being very offensive in odor. When abortion occurs early in the period of gestation, the symptoms will frequently be very slight. More or less discharge of a bloody mucus character will follow for several days after the loss of the foetus.

Treatment.—As soon as the symptoms of abortion are discovered, the animal should be separated from the rest of the herd, and put in a comfortable cow-house or shed. If the discharge is not offensive, it may be that the foetus is not dead, and the abortion may be avoided by proper care. Motions of the foetus are a sure indication of its not being dead. The cow should be kept as quiet as possible, and be allowed gruel only, except perhaps a few oats for a few days. By such precaution the irritating cause of abortion, or the conditions preceding it may be removed, and the evil avoided altogether. If the discharge be fetid, it is a sure indication that the foetus is dead, and the sooner it is gotten rid of the better.

If the water sack enclosing the foetus has not been previously broken, this should be done with the greatest care, in order not to puncture the womb, which would cause death to the animal. In other respects the treatment should be the same as though her usual period of gestation had passed.

The after-birth should be removed in the most careful manner, taking plenty of time. Haste or harshness might result in the death of the cow. Then syringe the parts out thoroughly with warm water, and follow it with an injection of carbolic lotion as follows: one ounce of carbolic acid to a gallon of water. Inject into the womb a half-pint of this lotion two or three times a day for a week or ten days. Should there be much hemorrhage, which may result from protracted labor, injuries to the parts from carelessness or lack of skill in removing the placenta, the injection of cold water into the womb, or water in which a little pulverized alum has been dissolved will generally remedy the difficulty. Too much importance can not be placed upon the necessity of removing all traces of the foetus and placenta, by burying them at a distance from the places frequented by the herd, and thoroughly cleansing the stable before it is occupied by other animals. A cow that has once established the habit of aborting will always be an unreliable breeder, and will generally prove most profitable to be fattened as soon as possible.

Albuminuria.—This is a disease of the kidneys, similar or identical with Bright's disease in the human species. It is supposed to be, to a certain extent, caused by an impoverished condition of the blood, and is most common where there is a too long continued sameness of food, or where other methods of injudicious feeding and bad management are practiced. This disease is sometimes cured in its early stages, but is very difficult to remedy when far advanced.

The most common symptom of this disease is the stretching of the body at full length, and getting the hind and fore feet as far apart as possible. It is usually accompanied by constipation, an unnatural gait, with the hind feet wide apart, stiffness, and a reluctance to move; the urine will be of a mucilaginous character, and dark in color. The liver, kidneys, and intestines are generally diseased in established cases, and in some instances the brain also sympathizes. Discontinue all green food except grass or ensilage, and give a good supply of grain. Milk and eggs are also excellent. The constipation should also be relieved by injections of lukewarm water.

Give also in one dose the following: Epsom Salts, twelve ounces; ginger, one ounce; gentian, one ounce; syrup, four ounces; water sufficient to make two quarts.

If the difficulty is not relieved, give the following recipe: two drachms sulphuric acid; one and one-fourth ounces tincture of cardamoms, mixed thoroughly in a pint of water.

Anthrax.—This disease is known by various names, according to the nature of the attack and its locality, such as Black Leg, Bloody Murrain, Black Quarter, Black Tongue, Quarter Evil, Carbuncular Fever, Charbon Bovina, etc. It is a common disease, and one to be feared by every stock-breeder, being virulent, malignant, and contagious. It appears under very different forms externally and internally, and attacks different species of the lower animals, as well as man, the manner of attack depending upon the influence that produced it, whether by inoculation or otherwise.

It is most destructive to the young cattle of America and the continent, and is characterized by an alteration and malcondition of the organic elements of the blood. In whatever part of the body the disease locates, that part turns black in color, and the blood of the animal becomes thick and black, hence the term "black leg," and "quarter evil." Diseases of this class are often so virulent and are propagated so extensively by contagion, that no state or condition of the animal system will be a protection against its deadly effects by contact. The causes of this disease may be traceable to the influence of temperature, evaporization from morasses, stagnant swamps, ditches, etc.; also food or water that has been tainted with decomposing animal and vegetable substances and contagion. One of our leading veterinary surgeons says relative to this disease:

"Rapid alternations of heat and cold, accompanied by excessive dryness or persistent fogs, torrid temperature, followed by storms, produce such wide contrasts in the air in which the animals under consideration live, and which they breathe, that it is not surprising to find their constitutions impaired when they are exposed to such violent changes, especially when we consider the fact that the health of the blood, so to speak, depends upon its exposure in a natural and temperate way to atmospheric influence. Each inspiration brings into contact with the blood the atmosphere surrounding the animal, and if at one moment it is hot, and at another cold and dense with moisture, it must certainly have a deleterious influence.

This cause alone breeds many diseases, and doubtless favors charbon. The disease is common in districts where large territories are covered with stagnant water, and where during very dry seasons such moisture is taken up, and the decomposing vegetable matters are exposed. Again, lowlands subject to semi-yearly inundations, when the water lingers for a long time on the pastures, render the animals living thereon particularly liable to charbon. In portions of the continent where this condition exists to a considerable extent, the disease is enzoötic. In Siberia, where marshes are numerous, it is stated that in 1784 nearly 100,000 animals perished. (Annals of Veterinary Medicine.)

Thus the bitter experience of the past has taught the stock-owners in certain districts where the action of the miasmatic gases and effluvia are so destructive, to move their animals to the hills during the heat of the day. In these low, marshy districts during hot weather, not only do gases emanate, but animalculæ are propagated to a certain extent; thus the food of cattle in such places furnishes the myriads of infusoria. The gases gain access with the air breathed. Soil also has its influence in the production of charbon. Clay and calcareous lands prevent the escape of water; hence stagnation, putrefaction, and effluvia. Other causes might be noted did time permit.

Black-leg is a disease of young cattle. It usually attacks those that are growing the fastest and doing best. Of a sudden the animal becomes listless, drops its ears, looks dull, a swelling is noticed along the back, neck, loins, or on a limb. If the latter, lameness is present. The creature now either lies or stands quietly and refuses to move; rumination and appetite are gone, bowels constipated, and urine high-colored. It must not be supposed that the disease localizes itself in a leg only, from its name, for it is a systematic disease and develops in any part, according to circumstances. The swellings, when rubbed by the hand, feel as though there is air under the skin; it crackles sometimes. These swellings are enormous, and at first are hot, after a time becoming deathly cold.

This disease does not have a long duration, and the animal usually sinks in a few hours, or, I might say, from a few minutes to thirty-six hours. The pulse runs high—from 80 to 110 beats per minute; eyes are dreamy in expression, ears pendant; the animal has no inclination to move; its movements stiff, is tender about the loins, lies down and objects to rising. The swellings are very characteristic of the disease, when once understood. The animal gets more depressed as time advances, and in a few hours is unable to rise. It may have convulsions, or die from exhaustion of the heart's action. The swellings noticed are blood

extravasations into the subcutaneous tissues. Decomposition soon takes place; gases are evolved, and these create the crepitus felt under the skin as the hand is passed over it. It is a disease rarely witnessed in animals over two years of age. It is essentially a blood disease, this fluid undergoing change rapidly, and having a tendency to decomposition. It is commonest in the best bred animals, which are doing the best, and is often seen in animals changed from poor to rich pastures.

Its origin is sometimes not traceable to any cause, and when the disease is recognized, it is of little use trying to abate it, as a rule, for by the time it is discovered, the blood is in such a condition that death ensues ere it can be restored to its normal vitality. Chlorate of potassium in from one to three-drachm doses, dissolved in water and given every two or three hours, is as good treatment as can be given. Whisky, spirits of nitrous ether, and quinine may also be of service. *Prevention is better than cure.*"

It will be seen from the above description, and causes of this malignant disease, that young cattle and those in good condition are most exposed to it, that it is caused by blood poisoning, and, that the latter is induced in many instances by bad sanitary conditions, and by sudden changes of temperature, or of pasture. A quick removal should be made from the infected pasture to one with better health conditions of higher ground, purer air, and pure spring water; at the same time separating the healthy from the sick animals. All carcasses of animals that have died of this disease should be immediately and deeply buried, and with them a generous amount of quicklime, that decomposition and disinfection may be effected as soon as possible—the flesh being alike poisonous to man and the lower animals. Rely mainly on nature for a cure, and improved sanitary conditions for a remedy, as well as a preventive of this direful disease.

In order to guard against it therefore, all the conditions and circumstances must be taken into account. Young animals must be kept in good condition and steady growth. Bleeding, although it should be resorted to but rarely, is sometimes attended with benefit in well kept animals. On the other hand, animals in a poor condition should be fed with more nutritious, laxative food, keeping the bowels, kidneys, and skin as active as possible without overtasking them. Linseed cake is excellent for stock in this condition, also bran, with salt frequently given, potatoes, etc., to keep the bowels open.

Guard against exposure to cold, especially nights. For unwholesome localities where the soil is overcharged with moisture, drainage is the great and sure remedy, as it removes the great cause of the evil. If drainage is not practicable, the stock should be removed from the ground as soon as it dries up in summer. When hay is fed from such meadows, it should be first watered with carbolic acid in the proportion of one part carbolic acid to 100 parts water. This is an antiseptic, is cheap, and perfectly safe to use.

The rapid fatality of this disease renders treatment in many cases of little avail; the chlorate of potassium, as previously recommended, is one of the very best known remedies.

Another method of practice that is sometimes beneficial, if the patient is not weak, is to give a dose of Epsom Salts,—from three-quarters of a pound to a pound to a full grown ox, —two ounces to calves,—dissolved in warm water, with one ounce of extract of ginger; this to be followed by two doses per day of one drachm nitro-muriatic acid; two grains bichromate of potash; two drachms chlorate of potash, mixed in a half-pint of water.

Bathe the tumors with a solution of carbolic acid. one part carbolic acid to twenty-five or thirty of water, and apply poultices to keep up suppuration for a time. Weak animals should have stimulants administered three times a day, instead of salts, such as whisky, ale, or ether, in from one to two ounce doses.

To the cattle of the herd that have been exposed to this disease by one or more sick animals, should be daily given in the food or water, as a preventive, about a drachm each of carbolic acid and chlorate of potassa per head. This may be continued for ten days or two

weeks, and should any new cases appear, the dose may be doubled, and a drachm of iodide of potassium added to it. The stables, yards, etc., where the sick animals have been confined should be thoroughly cleansed and sprinkled with freshly-burned quick-lime, and the woodwork, walls, utensils, etc., washed with a solution of chloride of lime, in the proportion of four ounces to a gallon of water.

Every caution should be used, as this disease is communicable to man; therefore never handle the carcass of an animal that died of this disease, or permit any of the products of a sick animal to touch the hands, as a slight scratch or sore on the hands might be the means of causing inoculation of this disease. The hands should always be washed with a weak solution of carbolic acid after any slight exposure.

Barrenness. (See STERILITY.)

Black Leg. (See ANTHRAX.)

Black Water. (See HAEMATURIA.)

Bloody Milk.—In very heavy milkers, it sometimes happens that blood will be more or less mixed with the milk, thus rendering it unfit for use. This may result from various causes, such as the harshness of the milker by hard pulling or pushing, or from the bunting of the calf. It also occurs as a consequence of inflammation of the udder, internal lesions of the teat, milk chamber, or quarter, etc. The treatment to be adopted should of course depend upon the cause of the evil, which should be removed if possible.

In large milkers the udder and milk veins are distended to their utmost capacity with milk, and any harshness in handling the teats or udder would have a natural tendency to create inflammation in that locality. In such cases, gentle treatment and more care in the milker will procure a successful remedy. Where the difficulty is caused by local irritation, either of the following remedies are very good:

Three drachms of camphor, three ounces of powdered oak bark; three ounces of powdered ginger. Mix and divide into six doses, giving a dose morning and evening in a pint of gruel. Another remedy; one ounce and a half of tannin, and four ounces of powdered gentian root; mix and divide into twelve parts, giving one part each morning and evening in gruel the same as the foregoing. Bathe the udder with luke-warm water, and apply extract of witch hazel. The udder should be stripped clean at each milking, and the cow kept in a warm, clean stable, free from cold drafts. Give warm mashes, and easily digested, sloppy food, for a time.

Bloody Murrain. (See ANTHRAX.)

Bronchitis.—This is an inflammation of the mucous membrane which lines the bronchial tubes, and may be caused by exposure to cold, or from the extension of inflammation that is always present in catarrh. The symptoms are rapid, painful breathing, each expiration being made with evident effort; a severe cough, accompanied a few hours after the attack with considerable fever and a rapid pulse.

The temperature of the body will frequently be from 100° to 105°, or even higher, as indicated by a thermometer inserted under the tongue, or in the rectum; the main portion of the body, the nose and horns, near the head, being unnaturally hot, while frequently the tips of the horns, ears, and legs will be cold. By placing the ear close to the sides and front of the chest, a harsh rattling sound can be heard in breathing. After three or four days, mucus and phlegm will be raised in coughing. The fever will generally subside in from six to eight days in mild cases, but if the inflammation extends to the lungs and pleura, which it is very apt to do, the disease then becomes pneumonia or pleurisy.

The animal should be put in a warm, comfortable stable that is well ventilated. Pure air, without exposure to draft, is very essential in this disease. Warm, soft food, such as

warm mashes, should be given, and such medicines as are cooling and laxative, together with good nursing. Epsom salts in from eight to ten-ounce doses, and saltpetre in from four to eight-drachm doses are very good remedies. Apply also a mustard paste to the lower part of the throat and sides of the chest. This done in the early stages of the disease will have a beneficial effect in arresting it. The animal should be permitted to have all the water it will drink, and free access to it, instead of at stated times, as it will then drink frequently in small quantities, thus allaying the fever, while if permitted to have access to it only occasionally there will be a tendency to drink too much at a time, and remain thirsty during the intervals.

Another very good remedy is 1½ ounces of acetate of ammonia, 20 drops of tincture of aconite, well mixed in a half pint of water, and given as one dose three or four times a day until the fever abates. This should also be accompanied with the use of the mustard paste, as previously recommended.

Bruises or Contusions.—Bathe the bruised part in warm water for some time, accompanied with gentle rubbing, if the soreness is not too severe to admit of it. Afterward apply tincture of arnica. The sooner this treatment is resorted to after the injury, the better. Warm water in such cases is far more effectual than an application of cold water or ice, as is frequently recommended.

Catarrh.—In cases of simple catarrh or common cold, the mucous membrane lining the nostrils and sinuses of the head become inflamed, affecting to a greater or less extent the eyes and throat. There will be more or less fever in the early stages, with occasional turns of shivering, sneezing, and coughing. The horns will be hot near the head, and cold at the tips; there will be a watery discharge from the nose and eyes, the eyes and eyelids showing inflammation; the pulse rapid, and temperature of the body unnaturally high; urine scanty and high-colored, and bowels usually constipated. In advanced stages of the disease, when badly affected, the nostrils will sometimes become obstructed, and the animal be obliged to find relief by breathing through the mouth, bloody matter occasionally oozing from the nostrils. The cause of the difficulty is generally exposure to the cold or wet; damp or badly drained stables; standing in a draft of air in improperly ventilated stables, etc. Put the animal in a warm, dry, well-ventilated stable; then feed hot bran mashes in a nose-bag, in order to steam the inflamed membranes. If the throat seems sore or swollen, apply mustard paste, and if this does not reduce the swelling after a few hours it will be well to put on a linseed poultice as warm as can be borne without discomfort. A tablespoon full of saltpetre dissolved in water, drank at night and morning, should also be given. The bowels should be kept open; a pint of melted lard may be given at first to relieve constipation, which, together with food of a loosening tendency, such as bran mashes, potatoes, etc., will produce the desired result. Injections of tepid water may also be given, if necessary.

If the discharge from the nose is copious and of long standing, inject into the nose once or twice a day a moderate quantity of the following astringent solution: Sulphate of zinc ½ drachm; glycerine, 1 ounce; mix thoroughly in a quart of warm water.

Good care and nursing are more essential than medicine. The principal thing of importance to be done is to remove the cause of the evil, and avoid exposing animals to such conditions as will lead them to take cold.

Chapped Teats.—Bathe in warm water until the surface is soft and pliable; wipe the teats dry and apply melted fresh lard, or what is better, sweet cream that has been simmered to an oil. Two or three applications a day for three or four days will generally be successful in effecting a cure.

An ointment that is frequently used with benefit is made of one ounce of powdered alum; one drachm carbolic acid; four ounces fresh lard. Extract of witch hazel is also excellent for bathing the teats in such cases.

Chapped teats usually result from a want of cleanliness on the part of the milker. If the teats are left clean and dry after each milking, there will generally be no difficulty in this respect. Great patience and kindness should be exercised by the milker when cows' teats are sore, taking plenty of time to soften the teats well with the warm milk before attempting to press upon them.

Choking.—This often results from feeding apples and uncut vegetables, particularly such as are round, like the potato. The best remedy is found in prevention, by cutting such food before feeding. Sometimes cattle will break out of the pasture and gain access to unprepared food, and in this way become choked. There is necessity of removing the foreign substance from the throat as soon as possible, or the animal will be liable to die of suffocation. Such cases are frequently attended with much pain; froth issues from the mouth, the body commences to swell from the amount of gases in the stomach and intestines, the creature groans and seems to be in great distress. We have known cattle to obtain instant relief by being made to sneeze, the spasmodic effort throwing the obstacle from the throat. An obstruction, if not too large, can sometimes be safely forced out of the œsophagus into the stomach by inserting a flexible rod or tube (rubber being the best material), and pressing it for a second or two at a time carefully upon the foreign substance. The tube should first be well oiled, and it would aid very materially to turn a half-pint of olive or linseed oil down the throat of the animal before the operation, to lubricate the parts.

This operation should be attended with great care and patience, or the tender membrane will be injured. The nose should be elevated before inserting the tube, in order to make the line of passage down the throat as nearly straight as possible. If the gullet should be ruptured or torn by the carelessness of the operator, or roughness of the instrument used, the consequences will prove serious. A hollow rubber tube is best for this purpose, and if the obstruction is passed into the stomach, the tube should remain there a short time to permit the escape of the accumulated gases. When the animal has become badly swollen, the gas may be neutralized by giving ammonia, or either chloride of lime or chloride of soda after the object has been removed. If ammonia be used, two ounces of the liquid in a quart of water should be given every half hour until the animal is relieved.

Three drachms of either the chloride of lime or the chloride of soda, dissolved in a pint of water, will usually give almost instantaneous relief. Care should be taken, after the obstruction has been removed, not to allow any solid food to be eaten for several days.

Colic or Gripes.—This disease in cattle is sometimes caused by constipation, but more frequently by drinking too much cold water when overheated. The flatulent colic is occasioned by the animal gorging itself on fresh, succulent grass. It is found also that cattle that are kept entirely on dry food, such as grain principally, are subject to it; also that young cattle are more apt to have it than cattle well matured. Cattle, however, are not as much subject to this disease as horses and some other of the domestic animals.

The symptoms are restlessness, with groans and apparent suffering. The animal will lie down and get up frequently, showing great uneasiness; the body becomes bloated, the swelling being most apparent on the left side. When the cause is constipation, the treatment should be mainly in the use of purgatives, clysters, and rubbing. For a purgative in such cases we would advise the following:

To one quart of warm water, add one pint of molasses, eight ounces of linseed oil, and half an ounce of powdered ginger. Mix well, and give in one dose. With the above it would be well to give an injection as follows: To two quarts of blood-warm water, add six ounces of olive oil or melted lard. If the colic should be attended from the first with a watery and unnatural discharge from the bowels, the following may be given as a regulator: Tincture of opium, 6 drachms; spirit of nitrous ether, 2 ounces; oil of turpentine, 1 ounce; water, 1 pint. Mix thoroughly and give in one dose.

From the beginning of the attack the animal should be rubbed well with flannel cloths, or brushes, such friction often giving great relief. If the pain continues very acute, rub mustard paste made of ground mustard, mixed with vinegar, over the under part of the body. Feed for several days, with care, on warm mashes and other soft diet, avoiding food of any kind that will have a tendency to irritate the bowels.

Congestion of the Brain. — The usual cause of this disease is a redundancy of blood in the system, the result of overfeeding, or a sudden change from a poor to a rich diet. It is in some instances caused by intense heat; oxen overworked in excessively hot weather will be liable to its attack. This disease is of comparatively rare occurrence. The symptoms are a peculiar wildness and anxiety in the animal's looks, attended with a nervous restlessness, frequent starting and groaning as though in great pain, suddenly lying down, and quickly rising to its feet again. The respiration is slow and labored, there being intervals when breathing seems to be entirely suspended. The movements of the patient are apparently attended with delirium. Sometimes there will be a fiery and frenzied look in the eye, followed by intervals of extreme languor and stupor; again the turf will be torn up by the feet, tossing it with the horns in the air, the whole physical system being under intense excitement. With these symptoms, lethargy eventually follows. When sudden frenzy is soon followed by lethargy, the case may be regarded as hopeless; but should there be a gradual subsidence, the pulse remaining normal, the animal may be regarded as on the road to recovery. Post mortem examinations of animals that have died of this disease uniformly exhibit an effusion of blood in the cavities of the brain, together with inflammation of the membranes of the brain, and a general congestion of the blood vessels.

There should always be prompt action in this disease. Bleeding from the jugular vein or temporal artery in quantity not less than two quarts for an ordinary ox or cow, will generally prove beneficial, but if the symptoms do not abate, this may be repeated a few hours later. After the bleeding, a blister applied to the top of the head, at the same time rubbing the sides of the neck with a mixture of cantharides and oil of turpentine, will have a tendency to relieve the brain. If the animal is constipated, relieve the bowels by injections and a mild dose of physic, such as Epsom salts, or linseed oil.

Constipation. — This is often the leading cause of many other diseases, since when long-continued it deranges the whole functions of the animal system. It is also the symptom of other diseases, and especially those of the liver. Farmers are generally too careless in observing the condition of their cattle in this respect, especially when they are confined in stables with little or no exercise, and fed mainly upon dry food. Cattle that have free range of pastures, or where soiling is practiced, and consequently are fed upon green food principally, generally require no attention in this respect. But when confined in stables, and fed upon dry feed, or in case of a sudden change from green to dry diet, there will be a tendency to a constipated condition of the bowels, which may require attention.

Constipation exists when there is not sufficient moisture in the stomach and bowels to maintain their healthy action, consequently the excrement will be retained for a longer time in the bowels, and be unnaturally compact and hard. This condition is caused or aggravated by too much dry food, an insufficient amount of water, and too little exercise. When long-continued, it is liable to terminate in inflammation of the bowels, colic, fever, etc., and is always an indication of some derangement of the system in man or beast. To correct this evil is a very easy and simple thing to be accomplished in the hands of an intelligent, ingenious person, who has a good amount of general knowledge and tact as a basis to work upon. The judicious use of bran, corn meal, ground oats, oil cake, roots, especially potatoes, and other laxative food, together with a plenty of pure water, will insure a perfect condition of the bowels, and continue to maintain this condition. Salt is also a great aid, and should be given

two or three times a week in winter, or be kept where all the animals can help themselves whenever they wish. When animals are allowed a liberal portion of salt, they will be induced to drink more freely, and when the bowels are in a torpid state, a large amount of water acts as a stimulus to the intestines in a manner similar to an injection of water, and will aid in softening and removing the impacted fæces.

When it is desirable to produce an action of the bowels promptly by artificial means, we know of nothing better than an injection of lukewarm water, such an injection being useful and effective only in proportion to the amount of water used. A quantity of water sufficient to distend the bowels causes a contraction of the muscular coat of the intestines, which expels whatever they contain. A pint of linseed oil, or from a pint to a quart of melted lard will generally prove a good laxative. Those having the care of cattle should always note the condition of the excretions of these animals when stabled, and remember that it is just as important for the welfare and health of the stock that the refuse matter pass out of the system in the proper *time* and *condition*, as that animals should be fed at proper times with nutritious and suitable food.

Cow-Pox or Vaccine Variola. — This is a disease that locates in the udder and teats of the cow, and is similar in many respects to the small-pox in the human family. A cow inoculated with the virus of small-pox will have a disease identical with the cow-pox, while a person inoculated with the virus of cow-pox will have a disease similar to cow-pox, or that may be considered a very mild form of small-pox. To have either form of the disease is a protection against a subsequent attack for a period, sometimes for a few years only, and sometimes for a lifetime, varying with different individuals in this respect; hence arises the practice of inoculation for the prevention of small-pox established by Jenner, which is now recognized by all civilized nations. Cow or kine-pox sometimes seems to make its appearance spontaneously among the cows of a farm or neighborhood, but it is more probable that generally it is communicated from one cow to another by the hands of the milkers, the one first infected having it in a mild form, which is not observed until it is given to the others.

It is a specific blood poison that has a period of incubation of from four to nine days, the first symptoms being a fever for two or three days, after which it breaks out in pimples on the teats, udder, escutcheon, flanks, and sometimes around the vulva, nose, mouth, and eyes. These are of a bluish-red color at first, surrounded by inflammation, and continue to enlarge, forming a distinct vesicle, sometimes attaining even an inch in diameter. After a time a scab forms over it, the virus dries up, and the sores gradually heal. This is usually accomplished in from fifteen to twenty days. This disease very rarely terminates fatally, but while it continues is very troublesome on account of the discharge and inflammation of the udder and teats, the soreness of the teats rendering milking a very painful operation.

No special treatment is necessary except good nursing, and avoiding taking cold. The bowels should be kept open, and for this purpose it may be well at the commencement to give from half to three-quarters of a pound of Epsom salts, and feed on warm bran mashes. If the teats are so sore and swollen as to render milking very painful and cause an injury or breaking of the skin, it will be necessary to draw the milk with a milking tube carefully inserted. This should first be warmed by inserting it in warm water, after which it should be oiled with olive oil and carefully passed up the teat. This should be done four or five times a day when the teats are very sore. When the udder is much swollen it will be well to bathe it in warm water, and apply a warm poultice of equal parts of ground flaxseed and bran. This can be held in place by means of a broad bandage, with holes for the teats.

Cystitis. (See INFLAMMATION OF THE BLADDER.)

Diarrhœa. — This disease is brought on by too sudden change of diet, especially from dry to green, succulent food; also by improper food, or that of inferior quality, poisonous

plants, bad water, etc., and is most liable to occur in the spring and fall. It often accompanies other diseases, such as indigestion and dyspepsia. If slight, it may be but an effort of nature to throw off some injurious substance from the body; but if too long continued it is quite liable to debilitate the system, and run into dysentery, which is more difficult to cure. It is particularly fatal to young calves, among which it is most common.

A mild purgative should first be given in order to assist, rather than check nature in the operation of throwing off from the system what may be injurious. The laxative may be as follows: One-half pound of Epsom salts, one-half ounce of ginger, two drachms gentian, mixed with one pint of gruel; this will be sufficient for a medium-sized animal. This should be followed in a day or two by medicine of an astringent nature, such as two ounces of prepared chalk, one ounce powdered oak bark, two drachms ginger, two drachms powdered catechu; one-half drachm powdered opium, one ounce of peppermint water; mix and give in a quart of warm gruel or milk. Sometimes a few ounces of finely pulverized charcoal will prove a very good remedy. For calves, from two to four tablespoonfuls of the above mixture, according to the size of the calf, may be given at morning and night in milk or gruel. One or two tablespoonfuls of lime water mixed with the milk two or three times a day is excellent for young calves, with which an acid condition of the stomach is very common.

With calves, the treatment should generally commence with a laxative dose, such as two ounces of castor oil with a teaspoonful of powdered ginger, given in a half pint of milk. About four hours afterwards give the following dose two or three times per day, according to the condition of the patient: prepared chalk, two drachms, or one ounce of magnesia; ten grains powdered opium, half a drachm powdered catechu; two drachms tincture capsicum; a teaspoonful of essence of peppermint; mix and give twice a day in gruel or milk. An ounce of starch or arrow root, boiled until it thickens, to which, when cold, add a half tablespoonful of ground cinnamon and two scruples of Dover's powders, is an excellent remedy also for calves, given night and morning.

In this disease give good nursing and avoid exposure to cold or storms. Common diarrhœa may be distinguished from dysentery by a too abundant discharge from the bowels in too fluid a form, the discharge sometimes being bloody. In dysentery the discharge is frequently mixed with mucus and blood, and accompanied with hard straining, the discharge being less in quantity than in diarrhœa, but more offensive.

Dysentery.—The symptoms of this disease are watery, bloody, and offensive discharges from the bowels, attended with considerable fever, great thirst, loss of appetite, and frequent attacks of severe pain. The secretion of milk gradually ceases, and the animal rapidly loses flesh. A common diarrhœa will frequently, if neglected, terminate in dysentery. It is also sometimes the result of a cold that settles in the bowels, eating poisonous plants, or from a lack of a sufficient supply of nutritious food. Oxen that are overheated by hard work and turned into a pasture to be exposed to a cold storm, are peculiarly liable to an attack of this disease.

The patient with this ailment should be kept in a warm stable and have careful nursing, not being allowed to drink too much water, although a moderate supply may be given. The treatment should be similar to that recommended for diarrhœa. If the discharge should be very offensive, showing a badly diseased condition of the stomach and bowels, give the following, one-half by mouth and the other half by injection: One-half ounce chloride of lime; one-half ounce tincture of arnica; one ounce sulphuric ether, mixed with two quarts of starch gruel. Dry, sweet food should be given, such as fine hay, oat meal, boiled potatoes, linseed meal, etc. Water in which a pint of flaxseed has been boiled, or flaxseed gruel, is the best drink in such cases.

Epilepsy.—This disease is quite rare in full grown cattle, except in cows after calving, but is of more frequent occurrence in calves or young stock. The animal shivers, staggers,

and falls down; severe convulsions follow, with foaming at the mouth and stupor. Sometimes the attacks are slight and of but short duration, the animal getting up after a few moments apparently as well as before the attack. Recovery is seldom so complete, however, but that the animal will be liable to subsequent attacks. The general condition of the animal should be regarded in the treatment.

If the patient is constipated, as is usually the case, loosen the bowels with a moderate dose of some laxative, and give nourishing, soft, and easily digested food for a time. For a full grown animal the following is a good remedy in such cases: One-half ounce of bromide of potassium; one drachm of powdered gentian. To be given two or three times a day for a week or two.

Another quite effectual remedy is to give with a little water daily a drachm of iodide of potassium, mixed with an ounce of the tincture of colchicum. In all such cases careful feeding should be adhered to.

Fouls.—When fed in low, wet pastures, or kept in wet, filthy stables, cattle and other stock are apt to have a disease of the feet, commonly known as the "fouls," or "foul in the foot." In sheep it is known as "foot rot." It usually makes its appearance between the claws of the hoof. Sometimes its first appearance is in the form of a swelling near the top of the hoof, which breaks and discharges a fetid pus. It is often very painful, causing severe lameness and loss of flesh and health to the animal, and should be treated promptly.

Remove the animal to a dry pasture, or a warm, clean stable. The soft spongy parts can be easily removed with the knife; this should first be done, and the parts thoroughly cleansed with castile soap and warm water; this to be followed by a thorough application of carbolic acid in the proportion of one part acid to eight parts of water.

Another method of practice is to cleanse the feet thoroughly as above recommended, and apply an ointment composed of one part of chloride of lime and four parts of fresh lard; or apply with a feather a solution of from ten to twenty grains of chloride of zinc in an ounce of water. A dressing of one ounce of sulphate of iron and four ounces of molasses, simmered over a slow fire till well mixed, and when cool applied to a piece of cotton or soft sponge, and secured upon the parts, will sometimes prove an excellent remedy. If any morbid growth or fungus should appear, apply equal parts of powdered bloodroot and alum sprinkled on the sore. This will generally effect a cure, even in obstinate cases.

It will be found beneficial in some cases to give a laxative in the form of Glauber's salts or Epsom salts, three-quarters of a pound dissolved in a quart of warm water, to which may be added a half-ounce of powdered ginger. Cleanliness in all the surroundings will prove an important adjunct in obtaining a quick recovery.

Fractures.—A fractured bone in an animal is generally a difficult thing to manage, owing to the difficulty of keeping the patient quiet for a sufficient length of time for the fractured parts to become united. As a rule, however, a broken bone is more easily repaired in cattle than with horses, owing to their being less nervous and restless. The treatment for fractures in cattle is essentially the same as for horses, which see (Vol. I, page 813).

Garget.—This is an inflammation of the udder, which affects one or more of its quarters; sometimes, in severe cases, involving the whole system. The inflammation is, however, generally confined to one or two sections of the udder, but in any case is a serious evil, and renders many valuable cows nearly worthless for milking purposes.

The affected part becomes inflamed and swollen, of an unnaturally high temperature, very tender and painful. The milk coagulates or hardens in the udder, producing inflammation wherever it is deposited, accompanied with fever. There will be a loss of appetite, chills, followed by fever, and a disordered state of the bowels. The milk will be thick, and sometimes bloody. The inflamed portions of the udder sometimes suppurate and break, dis-

charging a bloody pus. Even in mild cases the secretion of milk is considerably lessened, and in severe cases is often stopped altogether. In such cases also, the hip-joint, hock, or fetlock of the animal is frequently so swollen and sore as to entirely prevent her rising and standing.

This disease is most liable to occur in young cows just before calving, especially where they are large milkers and are kept in high condition. As the young cow approaches the period of parturition the udder undergoes a rapid and wonderful transformation to prepare it for supplying nourishment for the progeny soon to make its appearance in the world. The glands, which before have been small and undeveloped, increase to many times their former size, their blood vessels are enlarged, and the flow of blood through them greatly increased, while the wonderful power of milk secretion is perfected and carried on.

When there is danger of inflammation, by the udder being large and full before calving, it is well to draw a little milk each day a few days before parturition, in order to relieve the distended udder. This will sometimes be a necessity with heavy milkers in order to avoid difficulty in this respect, but it should never be practiced except when the conditions are such as require it. The udder should therefore be examined each day at this period, and if found to be hot, hard, and engorged with milk, a portion of the contents should be immediately drawn to encourage further secretion. This process will sometimes hasten the advent of the calf a day or two, but that is a minor evil compared with the result of running the risk of the animal having the garget.

Neglect for a few days after calving or when a cow is drying off, or the milking is abruptly stopped for other reasons, will also have a tendency to produce garget. Overstocking a heifer, in order to make her have a fine show of milk, is a barbarous as well as very risky practice, scarcely ever failing to bring on serious results, and is one of the most prolific causes of garget. We have known dealers in dairy stock to permit cows to be left from sixteen to twenty-four hours without milking, in order to give them the appearance of being excessively heavy milkers.

The writer knows of a very noted cow, valued at several hundred dollars, that recently died from the effects of such treatment. In such cases the udder becomes not only engorged with milk, but is congested with blood, a state which renders it at once fitted for the seat of disease. Failing to milk a cow clean will also bring on the garget. Besides those already mentioned, there are other causes of garget, among which are mechanical injuries, such as blows, kicks, wounds by the horns of other cattle, or bruises by the head or teeth of the calf; bites of insects, the practice of milking with wet hands and leaving the teats to dry, violent pulling or dragging upon the teats when milking, etc.; also wounds in the interior of the teat, resulting from the unskillful use of teat tubes and milking machines. Among other local causes of garget might be mentioned taking cold by wading in cold water, lying on the wet ground, on snow, or cold stones, exposure to cold rains, etc.

Finally, whatever induces derangement of the health of the animal system, with fever, tends to garget. For a few days before and after calving, cows, especially heavy milkers, should be kept on light food, and such as is not rich in nitrogenous elements or fats. A lukewarm bran mash or gruel that may be drunk by the cow in two pails in quantity per day, for three or four days after calving, is a safe as well as refreshing food. The bowels must be kept open by suitable food, or by mild laxatives, such as a daily dose of from four to six ounces of Epsom salts. In cases where the udder is gorged or overstocked, as where the cow has been lost for a day or more, the milk should be immediately drawn, if practicable, gently rubbing the udder with the dry hand for a few moments at a time, and stopping at intervals to draw the milk. Sweet oil well rubbed in helps to soften the gland tissue in such cases. In serious cases, camphorated spirits of wine is an excellent remedy for bathing the udder. Where the disease is very obstinate, tincture of iodine will be found beneficial

added to the camphorated spirits of wine, in quantity of one part iodine to four parts of the latter; this should be thoroughly mixed, freely applied, and well rubbed over the udder three or four times a day. With the last mentioned mixture it will be well to give once a day from half of an ounce to an ounce of saltpetre with the food or water, the quantity to be proportioned to the size of the animal.

A liniment composed of one part iodine, one part ammonia, and one part vinegar is also excellent for rubbing upon the udder to reduce the inflammation. In addition to this treatment it is well to permit the calf to run with the cow; this will keep the milk reduced in the udder and relieve the congestion. Sometimes the udder is so swollen that the cow will not permit the calf to draw the milk. If the inflammation increases and becomes general, with a high fever and occasional fits of shivering, give a dose of four or five ounces of gin or whisky in two or three quarts of warm water; also an injection of warm water. Cover the whole body with a heavy blanket or quilt, wrung out of as hot water as the animal will bear. Over this put on dry blankets; this will cause a profuse perspiration which will have a tendency to break up the fever. After sweating from half to three-quarters of an hour (which should be done in a warm stable), remove the blankets and rub the skin dry, avoiding a draft or anything that will cause a chill, or the temperature of the body to become much reduced. Then cover the body with a dry blanket. It may be necessary in some cases to give a dose of purging medicine, such as from three-fourths of a pound to a pound of Epsom salts, a half ounce of powdered ginger, half ounce of nitrate of potassa; mix and dissolve in a quart of boiling water; then add a gill of molasses, and give it to the cow lukewarm.

When the udder is much inflamed, a poultice may be applied which may be arranged into holes in the bandage for the teats, and fastened over the back of the animal with a strap to hold it in place. A water bag, as recommended in the treatment of puerperal or milk fever is also excellent. When the udder suppurates, the matter should not be left to be absorbed into the system, but if the poultice does not cause such swollen places to break, they should be opened with a sharp knife or lance, and the matter be permitted to escape. A cow that has once been attacked with this disease is liable to have it afterwards whenever she calves, and to grow worse in this respect instead of better. A slight attack even, is injurious, and great pains should be taken with heifers about to drop their first calf, in order to prevent an attack at the time of all others that they are most predisposed to it. No matter how valuable a cow may be, if even one teat, or one fourth of the udder is affected, her usefulness as a milker is greatly impaired. Prevention in all cases of this kind is therefore worthy of more consideration with the farmer than the curative remedies for the disease.

Glossitis.—This is an inflammation of the tongue, and is frequently due to some injury to that organ, such as wounds from foreign bodies in the food, gravel, thorns, etc.; in other cases it is sometimes caused by the action of mercury on the system, that has been given as medicine. The tongue becomes greatly inflamed and swollen, and the chief danger is from suffocation by the swelling of the parts around the hyoid bone, thus closing the glottis. Temporary or partial permanent paralysis of the tongue is sometimes occasioned by it, in which case the tongue hangs from the mouth an apparently lifeless appendage. The tongue should be carefully examined, and if there be any foreign substance in or about it, it should be removed; afterwards bathe the tongue freely in warm water.

It may be well also in the same connection to scarify it, making a few cuts in order to make it bleed a little to reduce the inflammation. Give a laxative dose of about a pound of Epsom salts dissolved in a quart of warm gruel, to which is added a half-ounce of powdered ginger. The mouth should be frequently fomented with warm water and syringed out afterwards with a mixture of vinegar and water, or a solution of a teaspoonful of alum to a half-pint of water. The animal should be kept in a cool stable free from flies, and have constant access to pure cold water, that it may drink whenever it likes. The stable should

be clean and dry, and supplied with a good bed of leaves or straw. For food give that which can be readily eaten, such as warm mashes, gruel, fresh cut grass, fruit, etc. Prompt attention and good nursing will soon relieve the difficulty.

Grub.—The gad-fly is very troublesome to stock towards the latter part of summer. This fly alights on cattle usually along the back, pierces the skin, and deposits its eggs underneath it. The egg hatches under the warm skin, a tumor or lump is thus formed, which soon bursts and leaves a small hole for the larva or grub of the fly thus hatched to breathe through. The larva here feeds on its surroundings, and grows to a considerable size. These grubs are sometimes called warbles. The pain that the gad-fly inflicts in depositing its eggs is so severe that cattle dread the insect instinctively; and when an animal is attacked it will often show great fear and excitement, running from the rest of the herd, making a direct course for the water, underbrush, or some other retreat, where it can escape.

The presence of the larvae under the skin causes considerable pain and annoyance, and the animal thus affected tries to lick or rub, if possible, the parts where they are located. The remedy is to remove or destroy the larvae. They can be distinguished by little lumps or tumors under the skin, each of which contains a grub or larva, and may be pressed out with the thumb and finger. They can, however, better be removed by enlarging the orifice with the point of a penknife or lancet, when they can be easily pressed out. They injure the hide of the animal, besides being of great annoyance. Rubbing the parts affected with turpentine or common kerosene oil will kill the larvae. Where cattle have been bitten by this fly, an early application of a mixture of two parts of tar, with four parts of lard well rubbed in over the bites, will usually end the difficulty at once.

Haematuria.—This disease is known by different names, such as "red-water," "black-water," "bloody urine," etc., the name being derived from the color of the urine, which varies from a pale pink to a bloody tint, varying in all the shades to a dark brown, the color being attributed to the presence of large quantities of albumen and iron, and the coloring matter of the blood. As the quantity of albumen and iron increases, the color darkens. When once fairly developed, this disease is apt to be very fatal among cattle. The symptoms are a rapid decline in milk secretion, constipation, feverish excitement, loss of appetite, rapid pulse, and irregular action of the heart. Sometimes it commences with a diarrhœa, which is succeeded by constipation.

Very soon after the attack the color of the urine will indicate the nature of the disease. Animals affected with it are dejected and stupid in appearance, and show a reluctance to move. It is sometimes attended, as the disease progresses, with a discharge from the eyes and nose, while the urine assumes a darker color, being sometimes nearly black. Examinations after death show the liver, kidneys, intestines, and in some cases, the brain, to be affected. In fatal cases the animal usually dies in two or three days after the attack.

It is found that cattle are most subject to it in the late summer, and it is usually confined to the animals that are out of doors, and are pastured on low, swampy lands. It is no doubt frequently caused by drinking impure water, eating improper food, by a change of pasture, climate, or food, particularly when such changes are from high to low lands. It is sometimes produced by blows and harsh treatment, the external violence injuring the loins and kidneys. When this is the cause, it may be distinguished by the blood passing in little clots distinct from the urine. Eating acrid herbage will sometimes cause this disease, also the excessive use of diuretics.

It is frequently attended with fever, and is apt to run into inflammation of the kidneys. When the difficulty is the result of external violence, which produces what is termed *Traumatic Haematuria*, keep the parts as cool as possible by laying cloths wet in cold water

over the loins, and if there is any constipation, give mild laxatives, and laxative food to keep the bowels open. Oil cake and bran mashes are excellent at such times. When the disease is of the idiopathic type, the treatment should be the same as for Albuminuria. Mustard paste well rubbed about the loins is excellent. The best remedy will be found in avoiding the conditions that cause the disease, by having improved sanitary regulations, supplying the animal with pure water, and wholesome, nutritious food.

Hernia.—This is commonly termed rupture, and denotes a protrusion of the bowels or their membraneous covering through an opening of the abdomen, which may become accidentally torn, the result of external injury or of severe straining. When a large portion of the intestines is thus misplaced and protruded, what is known as strangulated hernia results, which will cause inflammation and death unless it can be reduced in a short time. When the enlargement is slight, it can be easily pushed back and held in its place by passing a strap or bandage about the body with considerable pressure, the same being held in its proper place by being connected by a strap along the back and under the belly, with one around the neck; the strap along the back being made to pass under the tail like a crupper, while the connections under the belly keep it from slipping too far back. When the enlargement is great, a cure is not so easily affected.

Sometimes the rupture is of such a nature that there is a protrusion into the scrotum. Umbilical hernia,—or hernia at the navel,—is sometimes seen in calves at birth. Such cases can usually be remedied in the same way as previously recommended, but if it fail, wooden clamps are generally applied in such a manner as to include the skin over the rupture and tight enough to cause some inflammation.

Scrotal hernia,—or hernia of the scrotum,—is very difficult to reduce. A careful castration by what is known the "covered process" is sometimes necessary in such cases, which should never be attempted by any one but a skillful veterinary surgeon.

Hoose or Husk.—This difficulty is caused by a species of worms, the eggs being swallowed by the animal when grazing, especially in low, wet pastures. The symptoms are similar to those of bronchitis. There will first be a dry, husky, spasmodic cough, which eventually becomes more frequent and troublesome, attended at times with a discharge of mucus. Small worms will also be coughed up, sometimes singly, and sometimes in little balls or twined together. Remove the cattle to well drained pastures, and see that they are supplied with an abundance of pure water. Feed liberally with the most nutritious food, giving linseed or cotton cake, potatoes, carrots, bran, and such diet as will keep the bowels from being constipated. A moderate dose of sulphur for a few days will sometimes prove beneficial. The observance of sanitary conditions, good care, and nutritious food are the best means to be adopted in such cases.

Hoven.—This is an unnatural distention of the digestive organs with gas which is produced by the fermentation of the food in the stomach, and accompanies indigestion. It is usually caused by overfeeding on green succulent diet, especially clover, which is apt to be eaten very greedily, and in too large quantities by cattle after they have been kept for a long time on hay, and other dry food. The stomach is therefore very apt in such cases to become overloaded and clogged, which results in indigestion, as the stomach ceases to have power to act upon the compacted mass. Here it becomes moist and warm, begins to ferment, and produces a gas which distends the stomach to an enormous size, causing intense pain to the animal, the breathing being difficult, as though nearly suffocating. In severe cases, unless relief is given promptly, death soon follows from either suffocation, rupture of the coats of the stomach, or blood poisoning by the gases. Medicine is useless in such cases unless given in the very first stages. When given prompt attention, four drachms of chloride of lime in a little water will sometimes give relief by neutralizing the gas.

Ammonia, which is generally near at hand, given in quantity of two ounces in a quart of water every fifteen minutes until the animal is relieved, is an excellent remedy. Injections of warm water should always be given in the same connection. A hollow flexible tube introduced into the gullet will sometimes afford a little temporary relief until other remedies can be tried, by allowing a portion of the gas to escape. In case there is no relief from other remedies, it may be necessary to make an opening into the stomach and permit the gas to escape by this means, the latter being the best resort, and although sometimes a dangerous remedy, it is usually attended with good results.

Veterinary surgeons use for this an instrument called the trocar, which is the best for this purpose, but if one cannot be conveniently obtained (as delay may prove fatal), a sharp pointed pocket knife will answer the purpose very well. The incision must be made on the *left* side, about three inches below the spinal column, and about half way between the last rib and the point of the hip. The trocar or knife should be plunged in and downward, letting it pass in obliquely to avoid wounding the kidney. When the knife is used, a quill must be inserted in the opening through which the gas will soon escape, the hissing sound of its escape being distinctly heard. When food gets over the end of the tube or quill so as to obstruct it, a small piece of whalebone should be passed in to remove the obstruction and keep it open.

After the gas has escaped, the edges of the wound should be fastened together with a stitch of strong silk, or drawn together and held with an adhesive plaster. A purgative should follow, to remove the fermented food from the stomach, consisting of twelve ounces of Epsom salts, ginger one ounce, molasses four ounces, mixed with two quarts of water, and given in one dose for a full grown animal. The food should be light for several days. The prevention of this difficulty is never to permit cattle to have a sudden change of food, and thus gorge themselves. They should always have a gradual change from hay to grass, and at any time when turned into rank feed, such as the mowing lands in autumn (a practice not to be recommended, but very common in some sections), they should be allowed to remain but an hour or two for the first three or four days, until they have become accustomed to it. Changes from hay to grass, or from grass to hay should always be gradual, as well as that from short pastures to luxuriant mowing lands and clover fields.

Inflammation of the Bladder. — This is an inflammation of the mucus membrane lining the bladder, and is generally caused by some derangement of the digestive organs, such as the eating of poisonous plants, the drinking of impure water, an overdose, or too long-continued use of diuretic medicines, the use of cantharides, etc. The symptoms are pains similar to those in colic, the water is passed with difficulty and pain, it is albuminous in character and frequently scanty in quantity; at other times urination is unnaturally frequent; there is a loss of appetite, and the whole system seems disturbed and weakened. Give flax-seed tea or gruel in large quantities. Gum arabic water and slippery elm tea are also good. Warm water injections are highly beneficial and soothing, and if there is constipation, a mild cathartic should be administered. Apply cloths wet in hot water to the loins, over the region of the bladder, and keep the patient warm and quiet. Avoid constipating food. Warm bran mashes and food of a soft and moist character should be given.

Inflammation of the Brain. (See Congestion of the Brain.)

Inflammation of the Kidneys. — This is caused by taking cold, by external violence, strains, eating poisonous or diuretic plants, etc. The symptoms are similar in many respects to those of inflammation of the bladder, except that the urine is thick and dark-colored, and voided frequently in small quantities, with straining and evident pain. The hind feet are carried unnaturally far apart, showing great soreness and tenderness of the kidneys, while lameness is sometimes apparent in one or both of the hind legs. There will be considerable

fever, and sometimes in the later stages blood and pusy matter are mixed with the urine. The treatment should be identical with that for inflammation of the bladder, previously recommended. It is an obstinate disease to cure, and is very liable to recur on the slightest exposure to storms, changes of temperature, etc.

Inflammation of the Liver. — Animals that are kept in full flesh are most subject to this disease, it being frequently brought on by overfeeding. Sudden changes of weather, or cooling off too quickly when overheated will be liable to bring it on. Blows, kicks, or other external injuries that animals too frequently receive from thoughtless and cruel men having charge of them will also cause this disease. The symptoms are similar to those of jaundice or yellows, and the treatment should be the same. If the animal has been fed too high and is consequently suffering from surfeit, give a less quantity of nutritious food for a time. When the difficulty is caused by external violence, the patient should have a local treatment of the bruised part, the same as is recommended for bruises or contusions.

Inflammation of the Lungs. (See PNEUMONIA.)

Inflammation of the Udder. (See GARGET.)

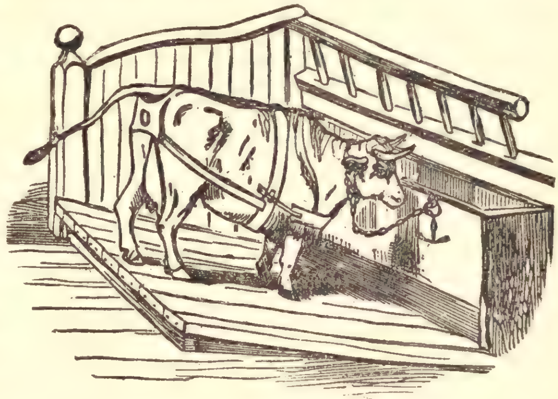
Inversion of the Uterus. — This is not of very frequent occurrence, although it is apt to result fatally when it occurs, if the services of an experienced veterinary surgeon, or a person skilled in the successful treatment of such cases cannot be readily obtained. It frequently happens that farmers are so situated that they cannot easily obtain such service, and as prompt action in all cases of this kind are essential, valuable animals are sometimes lost from lack of timely assistance. It is, therefore, important that every farmer and stock owner should understand the proper treatment in such an emergency.

Inversion of the uterus or womb, is liable to occur at the time of calving or immediately after, and is generally occasioned by the violent expulsive action of that organ at the very moment of expelling the calf; and also by the adhesion of the placenta or after-birth, by which means in the process of delivery the uterus is sometimes turned inside out, and hangs in an enormous mass from the body. This is, of course, a serious accident, and no time should be lost in returning it as soon as possible; yet it must also be done in the most gentle and careful manner, or fatal consequences will be the result. It is a delicate operation, and any rupture of the membrane, by pushing the fingers through it, etc., would cause death.

The head of the animal should be secured, and the hind-quarters raised a foot or more by placing something under the hind feet, if the cow is standing; if not, the hind-quarters should be raised in this manner. Get a clean bed-sheet and a pailful of blood-warm milk and water, about half and half in proportion, and a clean sponge. Dip the sheet in the milk and water until it is well wet, and lay it carefully under the protruding mass; it will require a man on either side to support it, while a third carefully sponges off any dirt or foreign substance that may be adhering to it. When thoroughly cleaned, sponge the uterus over lightly with laudanum, and carefully return it to its place. This may be done by two methods: by pushing the lowest part with the closed fist in the direction of the vulva, (first oiling the hands and arm thoroughly with sweet oil or clean, fresh lard,) while the uterus is being held up with the sheet by the two assistants, pushing the arm at full length into the body of the cow, taking the greatest care not to use violence; the uterus will usually go back into its place without much difficulty.

Another method which is preferred to the former by some, is to carefully grasp the part nearest the body with both hands, and then gently knead the parts inward, first with one hand and then with the other, until it is all replaced. If the hind-quarters are raised sufficiently high, and the uterus well lifted upon the sheet, it will slip back into its place readily with a little manipulation.

It will be well to give the cow two or three ounces of laudanum before commencing the operation, as it will quiet the animal, and also suppress violent straining, which will naturally occur under such circumstances, and will prove quite troublesome to the operator.



TO PREVENT INVERSION OF THE VAGINA.

After replacing the uterus, inject, or carry with a sponge, into it an ounce of laudanum. This will obviate the tendency to expel the uterus again after replacing it. If any portion of the placenta is adhering to the uterus, it should be carefully removed before returning it to its place. To prevent inversion again, let the animal continue to have her hind-quarters elevated from six to nine inches higher than the fore-quarters; then with a little ingenuity, a kind of breech strap could be devised with a large pad upon it, so arranged as to press upon the vulva and prevent the expulsion of the uterus, as shown in the above cut.

Itch. (See MANGE.)

Jaundice, or Yellows.—This is originally caused by a debilitated state of the stomach, which involves eventually a derangement of the liver. In this disease the bile ducts are obstructed, in consequence of which the bile is taken up by the lymphatic absorbents and conveyed to the blood, where it is carried to all parts of the body. The symptoms are a yellow tint of the white of the eye, the whole skin finally assuming the same hue. There is a weakness and general debility of the entire system, attended with constipation and loss of appetite, the animal seeming dull, with a disinclination to move about. When milch cows are attacked with this disease, the secretion of milk becomes lessened, it is of rank flavor, and frequently damages the butter of a whole dairy. This disease is difficult to cure when far advanced, as the liver becomes much diseased. In the early stages moderate laxatives are to be recommended. The following mixture will prove of great benefit, and usually effect a cure at this period:

Carbonate of soda, two drachms; cascarilla bark, three drachms; ginger, three drachms; to be given in a pint of ale. This may be repeated after four or five days.

The following drink should be given each morning and evening:

Venice turpentine, one-half ounce; powdered ginger, three drachms; powdered gentian root, one ounce; Castile soap, half an ounce; rub the turpentine and soap together in a mortar until thoroughly mixed, after which add the ginger and gentian.

The food should be easy of digestion and watery in character, such as roots, warm mashes, fresh grass, etc., and an abundant supply of water. It frequently happens that an animal will be entirely cured of this difficulty by being turned out to fresh grass. Exposure to cold storms should be avoided in this disease. Rubbing the whole body, especially the belly, two or three times a day, will be a great benefit.

Laryngitis, or Common Sore Throat.—This is an inflammation of the larynx or upper portion of the windpipe, usually attended with considerable swelling of the throat, sometimes to such an extent as to render swallowing difficult. It is also attended with a feverish state of the whole body. Mustard paste, or a mixture of ground mustard and vinegar, should be well rubbed externally upon the throat in the region of the larynx. After two or three hours it may be washed off and a fresh supply rubbed in. If this does not reduce the

swelling, a linseed poultice should be applied warm and soft, and frequently changed in order to keep it warm. This will induce suppuration. In the same connection, give a tablespoonful of saltpetre dissolved in the water that is drunk, morning and night. A little of the following mixture should be syringed well down into the throat several times a day: two ounces chlorate of potash, dissolved in one quart of water.

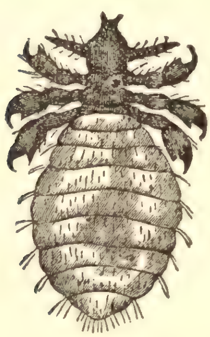
Leakage of Teats. — A very safe practice to prevent this evil, is to procure some collodion of a druggist, and as soon as the milking is over, cover the end of the teat with a film of it. This dries almost instantly, shrinking as it dries, thus closing the opening so gently as not to be injurious, and which will break away in milking. The use of elastic bands around the teats, or any mechanical device that compresses them, will prove injurious.

Leucorrhea, or Whites. — This is by no means a common difficulty with cows, and is rarely attended with very serious consequences, except in extreme cases, when it reduces the flesh and strength of the animal considerably. Such cows are never good breeders, being very liable to abort.

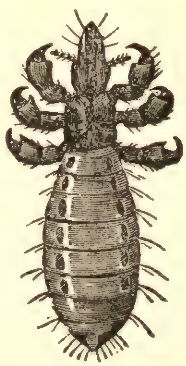
It is simply a catarrh of the vagina and womb that is attended with a discharge of a whitish fluid of a muco-purulent nature, and exceedingly offensive in odor. In slight cases, the frequent use of the syringe for a few days with warm water will generally end the difficulty.

When the discharge is profuse, or is caused,—as is sometimes the case—by the retention of the after-birth at calving, the treatment should be as follows: Syringe thoroughly with lukewarm water; afterwards give two injections a day of weak tea of white oak bark, or what is better, a solution of carbolic acid, consisting of one part acid to eight parts water. In connection with the same, the following combination will be found beneficial. Two ounces of powdered cubebs, three ounces powdered gentian root, one ounce of powdered sulphate of iron, and two ounces of marshmallow root. Mix, and divide into four parts, giving one part mixed with a little water into a paste, by smearing it upon the root of the tongue at morning and night for two successive days. After an interval of two or three days repeat the same as before, continuing the treatment every alternate two days as long as it may seem necessary.

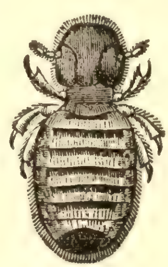
Lice.—These are the most common parasites with which cattle are afflicted, yet they



OX LOUSE.



CALF LOUSE.



BIRD LOUSE.

will rarely be found, especially to any extent, where the proper sanitary conditions in cleanliness are observed. Cattle that are worried and annoyed by lice will never be thrifty, however well they may be fed.

There are various species of lice that infest the ox, the principal of which are the common ox louse, the calf louse (both being a species of *Hoematopinus*, or blood-suckers),

and a species of bird louse, *Trichodectes*, which has no sucking tube, but strong biting jaws. The above cuts represent these parasites considerably magnified. Besides these, there is a kind of ox tick that is quite troublesome in some sections during certain seasons, and which are more common on Texas cattle than others.

Since the prevention of parasites is much more easy than their extermination when once they have made their appearance, every precaution should be used, and a sharp look out kept for them; all the more so if stock are for any reason a little out of condition. Stock that are kept well fed and in a thriving condition are less liable to vermin of any kind than those but indifferently cared for, while vermin are very apt to be found in ill-kept, filthy stables. Never permit fowls to roost in stables or sheds near or in which horses or cattle are kept, as lice from the former may be communicated to the latter very readily. Almost any kind of grease is destructive to this species of vermin, lard being frequently used for this purpose.

This may be applied along the spine and on the neck, shoulders, and sides of the body, being well rubbed into the coat. The lard should be applied warm, and a warm pleasant day be selected for the treatment. It is a good plan to mix one-third quantity of common kerosene oil with the lard. This causes it to spread better and penetrate into all the wrinkles of the skin, and such hiding places as lice are apt to collect; besides kerosene is very destructive to vermin. If kerosene is used alone for this purpose, it will irritate the skin and cause the hair to come off badly. Cattle thus treated will look in a few days as though they they had been scalded in patches. A little sulphur is also good to mix with the lard, especially if the skin is scurfy. Three parts of linseed oil and one of kerosene, well mixed, is also a good remedy for exterminating lice.

This can be put into a large spring-bottomed oil can, and easily applied by moving the point along close to the skin, and springing the point at each move. If the first application does not prove effectual, a second will generally complete the work. Tobacco steeped two or three hours in water, in the proportion of two pounds of tobacco to from five to four gallons of water, is also a good remedy. Apply thoroughly with a sponge. An infusion of quassia, made by steeping quassia chips, may also be applied in the same manner with great effect.

Loss of Cud.—In many of the diseases of cattle, the functions of digestion become more or less disturbed, and the act of regurgitation and remastication or "chewing of the cud," becomes temporarily suspended, which condition is commonly termed "loss of cud." This is sometimes brought on by the animal eating too much of food to which it is not accustomed, producing indigestion. It may be caused by any disease of the stomach, or liver, and is sometimes the result of a sympathetic fever setting in after a surgical operation, or a bad wound. There is, therefore, strictly speaking, no such disease as "loss of cud," but the term denotes a condition of the system brought on by various causes. The treatment must necessarily vary with the nature of the disease which caused the impaired digestion.

When the disease producing this condition is known, the cause should be removed by giving remedies for that specific disease. If there is no apparent cause, a moderate laxative, such as a pint of raw linseed oil or melted lard, a medium dose of salts is to be recommended, together with careful attention to diet and careful nursing. The following in such cases is a very good medicine to be given twice a day in a quart of warm stock ale: Powdered gentian, two ounces; powdered ginger, one ounce; sulphur, two ounces; powdered sulphate of iron, one-half ounce; mix. When surfeiting seems to be the only cause, simply withholding the food entirely, or in part, until the system can regulate itself, will usually bring about the proper conditions.

The animal in all cases should have all the pure water it will drink, with free access to salt. Warm bran mashes are good, especially where a constipated condition of the

bowels exists. Give also a moderate quantity of cut vegetables or apples. Where much debility exists, the following tonic will prove beneficial, given in quantity of a tablespoonful morning and night, mixed among slightly moistened oats: powdered sulphate of iron, four ounces; and ten ounces each of gentian, ginger, and linseed meal mixed together. The normal condition of cud-chewing will be re established only when the animal's condition is considerably improved, the above treatment being intended to assist in resuming all the natural functions. As this disease is frequently slow of development, the cure will also sometimes require considerable time for a complete recovery.

Malignant Sore Throat.—This is an acute inflammation of the throat, accompanied with swelling, which is apt to cause suffocation by pressure upon the lungs, being frequently fatal in its results with cattle, horses, and swine. The flesh of cattle or swine affected with this disease is very poisonous, producing a putrid state of the blood in those eating it. The carcasses of all animals dying with it should be deeply buried, with as little handling as possible.

It generally commences like a common cold, accompanied with some fever, shivering, and a cough; the throat swells enormously, the tongue sometimes protruding from the mouth, and is covered with purple or black spots. The disease usually reaches its extreme height in three or four days, the animal dying of suffocation. Early treatment of the proper kind will sometimes effect a cure. Apply the following liniment twice a day, well rubbed in about the throat and neck: liquid of ammonia, one ounce; oil of turpentine, one ounce; linseed oil, one ounce. In the same connection, inject well down the throat several times a day a little of the following solution: one ounce of chlorate of potash, dissolved in one pint of water. Warm poultices should be kept about the throat, such as those made of flax seed, meal, or bran. These will induce suppuration, and also reduce the swelling.

Mammitis. (See GARGET.)

Mange.—There are a variety of parasitic insects that are apt to infect cattle and all domestic animals that are ill-fed, and kept in a filthy condition. These burrow in the skin and produce intense itching, causing the animal thus affected to be rubbing against posts, fences, the sides of the manger, or anything that can be conveniently used for that purpose. In this way, as well as by personal contact, the disease is communicated through the herd. It is generally brought on by a half-starved, filthy condition, and shows great neglect and slovenliness in management. The treatment for this disease in cattle should be the same as for mange in horses, which see.

Milk Fever. (See PUERPERAL FEVER.)

Nephritis. (See INFLAMMATION OF THE KIDNEYS.)

Ophthalmia.—Cattle are subject to fewer diseases of the eye than horses, the most common being inflammation of the lids from exposure to cold, the introduction of foreign substances, or from external injuries, such as scratches from thorns, brush, blows from the horns of other cattle, etc. The eye should be closely examined, and if there be any foreign body there that is the cause of the inflammation, it should be removed, if possible, and the eye bathed several times a day in luke-warm milk and water, half of each being used in quantity. Sometimes the disease will result in a cataract, or the formation of a white film over the eyeball, producing total or partial blindness. The bowels should be kept open with mild purgatives.

If there is any opacity, or the formation of a white film over the eye, apply directly to it, morning and night, with a soft camel's hair brush, or feather, the following lotion: ten grains nitrate of silver, one ounce of water, thoroughly mixed. This treatment should be continued until the white film is gone, it being gradually absorbed by the lotion.

Another very good remedy, that will often prove successful, is to bathe the eye morning, noon, and night with a mixture as follows: Sulphate of zinc, twenty grains; acetate of lead, one drachm; tincture of opium, a half ounce; fluid extract of belladonna, two drachms; rain water, one pint; mix thoroughly.

Pleuro-Pneumonia.—This disease, sometimes known as "the lung plague," and "cattle plague," is one of the most contagious and fatal of all the diseases to which cattle are subject. It first appeared in an epizootic or contagious form among the cattle of Great Britain and Ireland, about the year 1841, although it had been known in the great cattle-breeding plains of Central and Northern Europe for ages. According to official reports more than a million of cattle died from this disease alone in the United Kingdom in the six years prior to 1860, the total value of which must have equaled, if not exceeded, $70,000,000.

Dr. George Fleming, Interpreter of the Army Veterinary Department, says in this connection: "The lung plague costs us, at the very least, £2,000,000 a year." Its introduction to this country was in 1843, in the vicinity of New York. It has gradually been disseminated along the Atlantic coast, although thus far restricted for the most part to the Middle States, Maryland, and a small portion of New England. It is to be hoped that more effective measures will be inaugurated by our Government than have hitherto been established for entirely stamping out this evil, and hereafter effectually preventing its introduction and spread.

Various experiments have been tried to counteract this disease, among which is that of inoculation as a protective measure, none of which have, however, thus far proved successful. It is a contagious fever, attended with local inflammation of the pleura, which is the thin membrane lining the thorax and investing the lungs, and is accompanied with great weakness and general prostration of the whole physical system, the more malignant types of the disease usually terminating fatally in a few days. It is, however, at other times so slow in its development that it may remain in the system for weeks before manifesting itself in any very marked outward symptoms. The early symptoms are a feverish state of the system, the temperature sometimes rising to 106°, accompanied with slight shivering, a loss of appetite, dry cough, scanty urine of dark color, and in cows also a drying up of the milk. This will be succeeded by soreness of the lungs, manifested by a pressure behind the ribs over the lungs, panting breath, and general attitude of the animal—the head drooping, nose extended, back arched, and hind legs drawn under the body. In the later stages of the disease there will sometimes be a constipated condition of the bowels; at other times the reverse, or a diarrhœa, the discharge being of a watery, fetid character. There will also be a watery discharge from the eyes and nose.

An examination of the lungs of animals that have died of this disease will frequently show large portions of them of a dark color, solid and elastic, of the consistence and weight of liver. Various remedies have been tested and recommended for this disease, but none as far as we are able to learn have proved successful. It is at least involving too great a risk for a farmer to attempt to cure an animal attacked with this disease himself; for while he is nursing and doctoring one animal, it is so terribly contagious that the entire herd are liable to be attacked by it. It is therefore safer to kill the animal at once as soon as the disease is known, and deeply bury the body as quickly as possible at a distance from any locality frequented by any of the herd, throwing over the body a quantity of quick-lime before covering it.

Prevention.—The preventive measures that have been recommended in relation to this disease are to suitably quarantine stock imported into this country for a period of time of sufficient length to determine with absolute certainty that there is no contagion of the kind about them; also the speedy destruction of all such as are affected, and the complete isolation of all such as have been exposed to the contagion. Inoculation with the liquid

extracted from the lungs of an animal affected with this disease is frequently resorted to in Europe, and in this country to a certain extent, but is in many respects unsatisfactory. Dr. Law recommends that stables and buildings where animals with this disease have been kept be cleaned and fumigated as follows:

"Remove all litter, manure, feed, and fodder, from the stables; scrape the walls and floor; wash them if necessary; remove all rotten wood. For buildings take chloride of lime one-half lb., crude carbolic acid four oz., and water one gallon; add freshly-burned quicklime till thick enough to make a good whitewash; whitewash with this the whole roof, walls, floors, posts, mangers, drains, and other fixtures in the cow stables. Wash so as to thoroughly cleanse all pails, buckets, stools, forks, shovels, brooms, and other movable articles used in the buildings; then wet them all over with a solution of carbolic acid one-half lb., water one gallon. When the empty building has been cleansed and disinfected as above, close the doors and windows, place in the center of the building a metallic dish holding one lb. flowers of sulphur; set fire to this and let the cow shed stand closed and filled with the fumes for at least two hours. The above should suffice for a close stable capable of holding twelve cows. For larger or very open buildings more will be required.

The manure from a stable where sick cattle have been kept must be turned over and mixed with quicklime, two bushels to every load; then hauled by horses to fields to which no cattle have access, and at once plowed under by horses. The pits, where the manure has been, must be cleansed and washed with the disinfectant fluid as for buildings. The surviving herd should be shut up in a close building for half an hour once or twice a day, and made to breathe the fumes of burning sulphur. Close doors and windows, place a piece of paper on a clean shovel, lay a few pinches of flowers of sulphur upon it, and set it on fire, adding more sulphur, pinch by pinch, as long as the cattle can stand it without coughing. Continue for a month.

Give two drachms powdered copperas, green vitriol, daily to each cow in meal or grains; or divide one pound copperas into fifty powders, and give one daily to each adult animal. Do not use for the surviving cattle any feed, fodder, or litter that has been in the same stable with the sick. They may safely be used for horses and sheep. In certain cases further measures are needed, as removal of the flooring and soil beneath, or even the burning of the entire structure. Drains must also be cleansed."

Pneumonia.—This is an inflammation of the lungs, and generally results from a severe cold, or is developed from bronchitis or inflammation of the larynx, the inflammation extending down into the lungs. It is more common among cattle and horses than any other of the domestic animals, frequently involving but one lung, and sometimes both. It is always accompanied with considerable fever, quick pulse, and rapid breathing. Sometimes the ears, roots of horns, and legs will be cold.

There are three stages of the disease, viz.: congestion or inflammation, the first stage; hepatization (the lung becoming solid), or second stage; and suppuration, or third stage. On a post mortem examination the diseased lung will frequently be found solid like liver.

Put the animal in a warm, well-ventilated stable, and if there be much fever, envelop the body in blankets wrung out in hot water, over which a rubber or dry blanket should be placed, to induce perspiration. It is also a good plan to put some hot bran mash in the bottom of a common nose basket, and allow the steam from it to be inhaled, or to cover the head with a blanket, and place a kettle containing something hot that will emit steam underneath. After keeping up a perspiration for about half an hour, remove the blankets, rub off dry with wisps of hay or straw, and cover for a time with a dry blanket to prevent a too sudden change of the temperature of the body. Great care should be used to prevent taking cold by a draft or other means. For further treatment, adopt that recommended for bronchitis, previously given.

Puerperal Fever.—This is usually caused by difficult parturition, exposure to cold soon after calving, retention of the placenta, harsh treatment, or overdriving shortly before calving, etc. Cows kept in high condition, and those that have been kept thin in flesh and suddenly transferred from this to an abundance of stimulating or succulent food near the time of dropping the calf are most liable to this disease. It is more liable to occur in hot weather, and is then most dangerous, it more frequently proving fatal at that season. It may come on at any time from a few hours after calving to the fourth or fifth day. Heavy milkers are most subject to it, but all cows generally have more or less fever at calving. If by neglect or improper treatment of any kind the secretion of milk is prevented, and the milk thus thrown back into the system, the inflammation, and hence the fever, is greatly increased.

A high fever with all its attendant symptoms is apparent in the early stages of this disease, the muzzle hot and dry, base of horns and extremities hot or cold, loss of appetite, ceasing to ruminate, countenance wild, eyes staring, restlessness, frequently lying down and getting up, colicky pains, urine scanty and high-colored, with a constipated condition of the bowels. Sometimes the mouth will be kept open, with the tongue hanging out at one side, the animal moans, and soon becomes irritable. When delirium follows, she grates her teeth, kicks at the belly, tosses her head about, and sometimes injures herself. The udder will be hot, swollen, and very tender from the first, attended by a suspension of milk. When the disease terminates fatally, the pains in the belly increase, prostration succeeds, and finally stupor and death follow.

A post mortem examination shows the womb and peritoneum greatly inflamed with occasionally purple spots. The brain also shows inflammation. A pound to a pound and a half of Epsom salts, according to the size and condition of the animal, should be given, dissolved in a quart of hot water; to which add one ounce of powdered ginger, one ounce powdered gentian root, a half pint of molasses; mix and give lukewarm. Give also injections of warm water. If this does not act on the bowels in a suitable time, repeat the dose.

In most types of milk fever the digestive organs are deranged, and the third stomach is loaded with indigestible food. It is therefore highly important that this condition should be counteracted as soon as possible, and purging when commenced at an early stage of the disease, will cause the fever to subside more readily. Rub mustard paste upon the belly to create a counter irritation, thus relieving the intense inflammation. If the animal from stupor should be unable to swallow, the stomach pump may be used in giving the purgative, to prevent the liquid from running down into the lungs.

If the udder is much swollen and hot, it will be well to treat it with the water bag, which is also very useful in treating garget. The bag should be made of oil-cloth or rubber, large enough and of suitable shape to enclose the udder, coming up to the body, flaring at the top and held up by a strap over the back. This should be filled with soft, warm water, 65° being a good temperature, to be changed occasionally when it becomes very warm. This will allay irritation, and reduce the inflammation and swelling.

Digestion first fails in this disease when the secondary or low stage of the fever comes on. The food remains in the stomach undigested, where it ferments, generating a gas which inflates the stomach and intestines. This state greatly affects the nervous system, and the hind extremities indicate weakness by staggering on attempting to rise, and failing to do so. The hind limbs sometimes under such circumstances become temporarily palsied. At this stage the pulse is the only sure guide. If it is weak, fluttering, and irregular, avoid giving anything of a purgative or weakening nature. The indications of the pulse of cattle have already been previously given, and therefore do not require repetition in this connection.

After the operation of the purgative, little will generally be required except good nursing. The animal should have a warm, comfortable stable, with a thick bedding of straw or

leaves. The stable should be kept clean and well ventilated, and it may also be well to cover the sick animal with a blanket to keep her warm. Warm gruel should be given her frequently, and light mashes. Attempts should frequently be made during the day to draw milk from the teats; the sooner this can be accomplished, the better. The return of the milk to the udder is one of the surest indications of a speedy recovery. One attack of this disease predisposes an animal to another; care should therefore be exercised to obviate the cause as far as possible.

Rabies, or Hydrophobia. — This is a disease known to originate in the genus *Canis*, such as the dog, fox, and wolf, and also in cats. It seems to be caused primarily by a blood poisoning, and not a disease of the nervous system, as was formerly supposed, and may be communicated to all animals and man by the bite of an animal thus affected, the virus being in the saliva and blood. This disease was known to the ancients, and is mentioned in the writings of Aristotle, Pliny, and Horace. Almost all animals that are bitten by a rabid dog are attacked with the disease sooner or later, while only a comparatively small percentage of men that are bitten by rabid animals are ever affected by it. A horse that is bitten by a rabid animal will generally be attacked in from twelve to ninety days—usually thirty days; cattle from twenty to thirty days, and frequently from ten to fourteen days; sheep from fifteen to seventy days; swine from twenty to forty-nine days. In mankind the period of incubation varies from a few days to months, and even years, it frequently being brought on by nervous anxiety, dread, and mental excitement respecting it. The first symptoms of the rabies in the dog, are a loss of appetite, sullenness of disposition, and restlessness; he will at times stand perfectly quiet with a vacant gaze forward, seems eager for water, but can swallow it only with great difficulty; sometimes the sight of water will throw him into convulsions; he bites at everything that comes in his way, even his chains and the boards in his kennel. The lower jaw sometimes becomes pendulous, froth issuing from the mouth; he continues to grow worse and generally dies on the fifth or sixth day.

Cattle attacked with this disease have similar indications; they are restless at first, refuse food, have considerable fever, delirium setting in early. Their destructive propensity is shown by striking and hooking with the horns, biting the manger, etc; the animal paws and bellows, has an evident desire for water, but cannot swallow it, continues to grow worse, death finally taking place in convulsions, or by paralysis. There is no known remedy for this disease, and even if there were, it would be dangerous to attempt treatment. All that can be done is to place the animal suspected of having this disease by himself, and confined in such a manner as to be powerless to do harm, and wait for the development of more positive symptoms. As soon as these are satisfactorily indicated, the sooner the poor animal is killed and thus relieved of its suffering, the better.

Red Water. (See HAEMATURIA.)

Rinderpest. — This terrible disease, known also as the "cattle plague," originated in Asia, and was carried into Europe as early as the fourth century. An extensive outbreak of this disease occurred in 1709; it is estimated by reliable authorities that not less than two hundred millions of cattle were destroyed in Europe during the eighteenth century by this disease alone. Of the causes that tend to develop the cattle plague, nothing definite is known, the principle of contagion not yet being fully understood, but when once an animal is infected with this deadly disease, it extends to every tissue and secretion of the body. Healthy animals will become infected by even coming near infected animals without contact with them, or near anything contaminated by their secretions or exhalations. Any object therefore may bcome infected, such as clothing, hay, straw, woodwork, etc., and carry the disease for a long time. Even dogs and cats have been known to have carried the disease in their fur, and birds in their plumage. It is also known that a small quantity of blood, or

excrement from infected animals on the sole of a shoe, or end of a cane, has sometimes been sufficient to carry the disease to a great distance.

An important authority says, in this connection: "All who have investigated the subject of rinderpest have been struck with the important place held by excrement in its propagation. As the disease concentrates its morbid action on the stomach and bowels, their products are especially charged with the poison; and if brought in contact with other animals in their fresh condition, or after having been closely packed in a mass, they will communicate the disease with the greatest certainty. Hence the history of the malady is full of instances of infection from recently manured fields, from those on which the manure has been spread but frozen for weeks and months, from grazing on fields formerly occupied by diseased animals, and from occupying buildings, yards, loading banks, wagons, cars, ships, and boats in which the sick have been. The manure is usually deposited in masses, thick enough to prevent the ready destruction of the virus by the action of the air, and hence its virulence is only extinguished by the slow process of putrefaction. Whatever, therefore, retards this process, will prolong this danger; and thus the frosts of winter, and the firm packing of the manure, will each favor the retention of the contagion."

When the carcasses of animals infected with this disease are left accessible to dogs and other animals, the meat or bones are liable often to be carried by them to be eaten into the very yards or buildings where cattle and sheep are kept. The importance of preventing the spread of this contagion by deeply burying such carcasses as soon as possible, will readily be seen. All ruminating animals are liable to rinderpest, but cattle are more liable to it than sheep, goats, and deer. The development of this disease is sometimes so rapid that death occurs after the second day, but usually from five to six days after the disease makes its appearance.

From the time of infection, this disease usually makes its appearance somewhere from the fourth to the ninth day, and generally on the fifth or sixth from the date of exposure. The period of incubation has in some exceptional cases been known to be protracted to two, or even three weeks, but the general rule is as above stated.

The first symptom of the cattle plague is a very perceptible increase in the temperature of the body, which may be readily detected by a thermometer introduced into the rectum. This occurs from twenty-four to forty-eight hours before any other change is noticeable in the infected animal. The temperature of the body will rise to 105° or 106° F., accompanied with other fever symptoms, such as shivering, dryness of the skin, twitching of the muscles, a staring coat of hair, restlessness, colicky pains, unequal distribution of temperature throughout the body, with sudden changes of temperature, particularly noticeable at the base of the horns.

At first, the bowels will generally be constipated, which conditions will be succeeded by violent purging; the dry and hot condition of the eyes and mucus membrane lining the nose and mouth in the early stages is followed by a watery discharge, which soon takes a turbid form resembling pus. The urine is scanty and dark colored, and the pulse very rapid. The mucus membrane throughout the body undergoes a peculiar change that is especially noticeable in the vagina of cows, and may also be seen in the mouth and nose of all animals infected, which in the early stages become spotted or striped with red, such spots showing great inflammation. About twenty-four hours after the red spots make their appearance, yellowish white or gray specks may be seen on the red ones. These specks may be easily rubbed off by the finger, being formed by the loosening of the cuticle. When thus rubbed off a dark red depression remains. As the disease progresses the body gets cold, and the animal finally becomes unconscious and dies.

In some cases small tumors and eruptions are seen about the neck, dewlap, or flank.

The sub-cutaneous cellular tissue frequently becomes filled with gas, giving the body a bloated appearance.

Many of the symptoms of rinderpest are seen in the pleuro-pneumonia, or lung disease, also in the malignant catarrhal fever, and in the mouth and foot disease. It is found by a careful estimate that about seventy-five per cent. of animals infected with this disease die, and those that survive do not have it in its most malignant form. The disease is less severe in summer when cattle are grazing than in winter, when kept in close stables and fed on dry fodder.

There is no known remedy for this disease; hence, in dealing with it, the only security is in prevention, and in extinction. Most European governments have passed stringent laws for protecting their respective countries from the invasion of this disease, and for its extinction when it occurs. In this respect the laws enacted by the German Empire may be regarded as the most complete and effectual, being based upon the results of experience and scientific investigation.

The only safety is in promptly killing and deeply burying all infected animals, and in isolating from all others of the herd all such as are suspected of having it. An animal once recovering from this disease never has a subsequent attack.

Ringworm.—This is a parasite, which may be transferred from one animal to the others of the herd, and is quite common. It is known by bald patches on the skin, covered with white scales and scabs, showing some eruption.

The parts should be washed with soap and warm water to remove the scabs, and when dry anoint with lard and sulphur, as recommended for mange in horses.

Sprains.—The best treatment for strains and sprains in cattle is identical with that recommended for the same in horses (which see).

Sterility.—Barrenness in cows may often be overcome by reducing them in flesh, such cows almost always being in high condition. When an excess of fat seems to be the cause of the difficulty, reducing the food, or keeping on short pastures for a few weeks previous to service, will frequently overcome the difficulty. It may also be well in the same connection to give a small dose of Epsom salts occasionally.

Giving hemp seed each day for two or three weeks previous to and after service, also flax-seed tea, will in some cases have a very favorable effect. If the cow is quite thin in flesh, improve her condition a little by better feed. A careful examination will sometimes determine the nature of the difficulty. For this purpose the hand and arm should be well smeared with sweet oil or fresh lard, and carefully introduced along the vagina with a rotary movement, to prevent injury, until the *os uteri*, or mouth of the womb, is reached. It can then be determined, by careful examination of the parts, whether or not this is impervious.

If there is a gummy substance, or any other mechanical obstruction, it must be broken through or cut. The latter would probably require the assistance of a good veterinary surgeon. Sometimes the opening can be effected by dilating it with the fingers, by using a gentle, rotary motion. This treatment should be followed by smearing the parts with two drachms of solid extract of belladonna. Repeat this treatment the following day, using one-half the quantity of belladonna, and permit service four or five hours afterwards.

A tea of red oak bark injected into the vagina daily until the period of œstrum, then omitted for a day or two, and allowing service, will sometimes prove effectual. In making flax seed tea, use a half pound of whole flax seed (not meal) to a gallon of water, and steep for several hours, giving from one-half to a pound daily.

Stricture or Obstructions in Cows' Teats.—The flow of milk from the teats may be impeded by a variety of causes, the obstructions sometimes being but partial, at others complete. Obstruction is frequently due to the presence of milk stones within the

canal of the teat, stricture, tumors attached to the lining of the teat, or the formation of a false membrane. Great care should be used in the treatment, as irritation may be the result, which will cause inflammation and possible loss of that quarter of the udder. Any obstruction like milk stones may be frequently pushed up through the canal of the teat into the milk chamber, where they may remain without harm. For this purpose, a silver probe or knitting needle may be used, first smearing it with sweet oil. It should be inserted with caution to prevent irritation, great care being used not to insert it any farther than the extent of the teat, to avoid injury to the milk gland. The probe should be inserted two or three times a day, always first oiling it, and gradually increasing the size of the probes used until the stricture is removed.

In case of the formation of a false membrane, a double-edged probe may sometimes be used with benefit, and an elastic rubber bougie inserted, leaving an inch or so in length protruding outside the teat, to render its removal easy at milking time. Its insertion will not be required for more than a week or ten days, or until the cut membrane is entirely healed.

Tetanus or Lockjaw.—This disease usually arises from some injury, such as a nail puncture or other wound to the foot. It may also be caused by improper food and exposure to cold. It not unfrequently follows castration. The early symptoms of this disease are a loss of appetite and a disinclination to move. The whole body becomes sooner or later affected, the muscles rigid, breathing short, pulse quick and wiry, bowels constipated, urination scanty or checked altogether. The animal stands with the hind legs wide apart, nose extended, head and tail elevated, and the back in an unnatural position, sometimes arched and sometimes depressed. But little can be done for this disease, especially when beyond the first stages, other than to give quieting medicine and open the bowels; also relieve the bladder as soon as possible. Keep the animal quiet and in a darkened, comfortable stable, always avoiding a strong light.

Bathing in warm water and rubbing in a good supply of tincture of arnica soon after the injury is received, will have a tendency to ward off the disease when the foot is injured by a puncture or otherwise. All nervous excitement should be avoided.

Texas Fever.—This disease is also commonly known as Spanish fever, splenic fever, etc. It originated in the low lands of Mexico and Texas, and has been extended to other localities through the introduction of Texas cattle, it being communicated from one herd to another by infected animals being driven over the road, or pastured on lands frequented by other cattle. During the spring and summer, for many years there has been a large shipment of these wild, roving cattle to the Northern States, some being used for beef at once, while others are turned out to pasture for the season, in order to be in better condition for the market in the fall.

By this means the native stock in these localities has become infected with this disease, which has extended to others, until it has become of no uncommon occurrence in the Western and Middle States, some cases of it having been known even in New England. This malignant disease often makes its appearance very suddenly, rarely however breaking out before the middle of August, and continuing until cold weather. It never occurs spontaneously in regions visited by frost, and when carried to this region in summer, will die out soon after frost comes. Texas cattle wintered at the North will not communicate it the following summer. Several of the Western States suffered such heavy loss from this disease by the importation of Texas cattle and their transportation through them, that legislative measures were adopted a few years since to prevent such cattle from being brought in, and which resulted very successfully, the disease at present being much less common than formerly.

The period of incubation has not been definitely determined by experiment, but it is supposed that from ten to forty days may elapse after the animal has been exposed, before

the first symptoms of the disease may appear. There seems to be a great difference in animals with respect to their susceptibility to this disease, while the temperature and time of the year have much to do with its early progress. It has been found that it is most virulent and fatal in warm, sultry weather, and most inactive in cold, wet seasons.

Symptoms.—The symptoms, etc., of this disease are given as follows, by an authoritative writer having considerable experience with it:

"The manner in which this affection appears is quite variable, owing to the age and general condition of the animal. In cows, the diminution of milk is one of the first symptoms. The ears droop, the gait is sluggish and tottering, with a disinclination to move. The animal will stand in one position, with head depressed, when more or less trembling will be seen about the flanks. In a few days, the patient looks thin and hollow. The abdominal walls will appear shrunken, and the back will be arched, as though suffering from distress or internal pains.

The skin is usually dry and hot, especially about the head, and rarely moistened on any part of the body with perspiration. The bowels are costive, but not unfrequently a fetid diarrhœa will supervene in the last stages. The urine is invariably scanty, high-colored, and even bloody. In fatal cases, the bladder becomes distended, its wall paralyzed, and all power of micturition lost before death.

The diagnosis of this malady, therefore, is not difficult, especially with the aid of a thermometer, to determine the degree of fever heat. The elevation of temperature indicates the severity of an attack, and will be found to vary from 101 degrees, the normal standard in cattle, to 107, in fatal cases. The "ticks" are an important aid in doubtful cases. Their presence serves as a *label*, to tell us either from whence the animal came, or the exposure it has encountered. Consequently, when we find a sick creature that is covered with ticks, and shows a high fever heat on thermometer, we can be almost sure, even at an early stage, that it is a case of the Texas plague. But this will soon be corroborated by a high-colored urine, which, on account of the congested condition of the kidneys, is a characteristic symptom; and, in fact, we have never seen an animal sick with this complaint that was not affected with haematuria.

Post-Mortem Appearances, etc.—The morbid aspect of the internal organs, after death, is so marked, that we are enabled to decide a doubtful case at once. The spleen, or milt, is always found much enlarged. It is often increased to five times its normal weight. This organ is so completely engorged with blood, that chemical changes set in before death. The tissues will, accordingly, appear soft, and not unfrequently the viscus is found ruptured. We have examined several cases where the spleen was more than two feet long, eight inches wide, and three in thickness, and weighed ten pounds. Such an organ cannot easily be overlooked.

The liver has a softened and waxy appearance. It is very yellow in color, but with an occasional tinge of greenish black. This organ is usually much congested and enlarged, weighing from twenty to thirty pounds. The gall-bladder is surcharged with dark, viscid, and flocculent bile, the granular nature of which is brilliantly shown by transmitted light.

The kidneys, as before observed, are congested, swollen, and softened. They are often so much enlarged as to appear disturbed in form, as though they were twisted. On section, the tissues are dark, and unnatural in appearance. Hence the bloody urine, scanty though it be, that must escape from such an impaired organ, and which at once becomes of vital importance in the animal economy.

In ordinary cases, the heart and lungs show no signs of disease. But there is more or less inflammation of and erosion about the stomach, especially in the fourth apartment, known as the *abomasum*. This, with the upper portion of the bowel, is congested and

partially softened, the effects of which changes are often seen in healthy Texas cattle when slaughtered in Northern markets.

The blood also undergoes important changes. The red corpuscles are perceptibly modified in form and size, as well as wonderfully diminished in quantity, in the last stages. Hence the reason for the diffusion of the coloring matter all over the body before death. Bile can always be detected in the blood of one of these sick animals, and thus acts as a solvent on the anatomical elements. Cholaemia, therefore, exists, as shown in all the exudations beneath the skin, and in all the internal organs.

With the condition of the system as seen from a *post-mortem* examination, treatment can avail but little. Various plans of medication have been resorted to, but thus far with questionable results. No specific medicines have yet been found to stay its ravages. Eliminatives and antiseptics would naturally seem to be called for, and have been given in certain cases with good results. But it is impossible to select even an approximate remedy until the pathology of this contagious malady is better understood; and this can only be accomplished by experimental investigation, which should ever be the theme of a National Sanitary Commission, appointed by the President."

Tuberculosis.—This disease, which is identical with consumption in the human family, is more common in cattle than any other of the domestic animals. It is also found more frequently in cows than in oxen, those cows that have been kept in dairies a long time been particularly predisposed to it. It would seem from this fact that the drain upon the system by continuous milk production might be regarded as a predisposing cause. Dark, under-ground stables, poor ventilation, cold, damp sheds; insufficient food, or food of poor quality; all tend to the development of this disease. Tuberculosis is also hereditary in all grades and classes of cattle, but particularly so in these which are in-and-in bred. In fact, we believe there is no one cause more potent in the production of this disease than the common, yet pernicious system of in-and-in breeding.

Calves but from two to three months old have been known to die from this disease, a *post-mortem* examination showing the lungs and pleura filled with tubercular tumors. This is only one of many proofs of its hereditary character. In-and-in breeding cannot be followed long without a deterioration in the constitutional vigor and hardiness of the stock thus bred, and breeders would do well to give more consideration to this subject and thus avoid the evils resulting from it.

This disease is also contagious, as has been proved by various experiments on animals. When sound animals are placed in the same stable with diseased ones, so as to eat from the same manger or inhale the air expired from their lungs, infection will follow as a natural result. Hay that has been breathed upon by a diseased animal becomes contaminated, and infection will take place by this means through the digestive organs. Stalls that have been occupied by infected animals will also be the cause of this disease, providing they are occupied by others before being properly cleansed.

Dr. Villemin of the Val-de-Grace Hospital, Paris, made numerous experiments on animals a few years since, with a view of testing the question whether human consumption might not be caused by the introduction of a specific virus into the system. He inoculated rabbits and guinea pigs in various parts of the body, with matter taken from a diseased human lung, which resulted in many of them dying, while others lingered in a suffering condition until killed, and in every case tubercular deposits were found, thus proving that the disease had been transmitted by inoculation. He also inoculated rabbits with matter from the diseased lung of a cow, with the same result as before, and thus demonstrated that tuberculosis, or bovine consumption, is identical with consumption in man.

Prof. Chauveau, of Lyons, found in his experiments that this disease can be as readily transmitted through the digestive organs as by any other means. He gave to three calves

an ounce of a diseased lung taken from a cow. In two weeks one of the calves began to fail very perceptibly. In about three weeks from giving the first dose he gave another of the same quantity, and all the symptoms of the disease were soon manifested. They became rapidly emaciated, with occasional fits of hard coughing. In about eight weeks the calves were killed, the post-mortem examination showing a diseased condition of the lungs, bronchial glands, and system generally that is characteristic of tuberculosis. These experiments are sufficient to demonstrate conclusively that tubercular consumption can be transmitted from one animal to another, and from them to man in many ways, and especially by the eating of diseased meat. The flesh of animals infected with this disease is not only unfit for food, the blood being poisoned with virus, but is absolutely dangerous as a medium of communicating the disease.

The earliest symptoms of this disease are generally an unthrifty condition, the animal becoming thin, with a failing or capricious appetite. If a cow, the milk becomes thin and watery, although not much diminished in quantity; the coat looks dull and rough, and the animal has a dry, hard cough. The breathing will be short, the lungs showing tenderness and soreness when pressed upon. The blood gets thin and watery, and frequently a diarrhœa will set in, with a fatal termination after a few days. Judicious treatment in the early stages may possibly result in a cure, but is of no avail when the disease becomes established.

Apply mustard paste to the chest sufficient to cause counter irritation, and feed liberally oleaginous food that is easy of digestion, such as oil cake, together with bran mashes, etc. Give also cod liver oil to the amount of half a pint per day, mixed with the same quantity of whisky. Avoid all foods difficult of digestion, and give good care and nursing.

Tympanitis.—(See Hoven.)

Venomous Bites.—All cattle, when grazing in the summer season, are liable to be bitten by poisonous reptiles or insects, and stung by hornets, wasps, or bees. It not unfrequently happens that in the Western and Southern sections an animal will be badly poisoned from the bite of a rattlesnake, tarantula, or some other equally venomous reptile.

The bites or stings are usually about the head; the tongue or nose not unfrequently being the point of attack.

For either bites or stings we know of nothing more effectual than the spirits of ammonia or hartshorn, and this should be applied freely to the injured part as soon as possible; a cloth or sponge saturated with the liquid being the most convenient thing for the purpose. If used immediately after the injury, the effect will be almost instantaneous. If no ammonia is at hand, common baking soda or saleratus may be dissolved with water and applied as above, followed afterwards by an application of linseed or sweet oil. Three parts of spirits of ammonia to one of oil is also a good remedy. Good effect may also be derived by thoroughly moistening ground chewing tobacco with water and binding it upon the wound. In mild cases an onion, bruised sufficient to extract the juice readily, and bound upon the injured part is also a good remedy.

To protect against gad flies, wash the flanks and other parts most commonly attacked by a strong infusion of the green bark of the common elder, or of tobacco, the same as for killing lice. To protect against buffalo gnats, that are so troublesome in some localities, smear the parts most liable to attack with a mixture of tar and lard, in the proportion of one part tar to two parts lard. Equal parts of tar and petroleum are also excellent.

For the bite of a rattlesnake, or other poisonous snake, apply immediately strong spirits of ammonia, and keep the wound and adjacent parts constantly wet with it for hours by means of a sponge. Give also as quickly as possible the following: one pint of whisky, one tablespoonful of spirits of ammonia, one-half pint of water. Thoroughly mix and give at once. It may be necessary to repeat one-half of this dose for two or three hours until the

animal is relieved. It may be well to cauterize the wound with a hot iron or creosote before applying the ammonia.

Tarantula bites, stings of centipedes, scorpions, etc., should be treated the same as snake bites, except cauterizing.

Warbles.—(See Grub.)

Warts.—Small warts may be closely removed with scissors; large ones having a small neck may be strangled by tying a strong waxed silk thread around the base as low as possible. If the wart does not drop off in the course of a week, another ligature should be applied in the same manner. Whichever method is resorted to for their removal, cauterize the place after their removal with lunar caustic, or touch them daily with some tincture of iron. If the warts are flat, and hence cannot be ligatured, apply once or twice a day nitric acid, until they disappear. When they are well burned down, apply twice a day sweet oil or fresh cream simmered to an oil.

Wens.—In the early stages, when first started and soft, bathe in warm water and apply warm poultices until the soreness is partially removed; then paint them with tincture of iodine once a day. If they become hard and large, they will have to be taken out. Dress the wound two or three times a day, washing it with a carbolic lotion of one-half ounce of carbolic acid to one pint of water. It would be a good plan to bind on the wound a sponge wet with the lotion.

Wounds.—Wounds on the body may be sewed up or drawn together by means of cloth so cut as to alternate in strips and overlap, to which some kind of adhesive plaster should be applied to hold them in place, drawing them carefully together so as to close the wound before pressing the overlapping ends upon the surface. Before drawing the wound together, the hairs on the edges should be all clipped off; be careful to have everything clean, and permit no foreign substance of any kind get into it. When sewed, the wound should be drawn together with a needle slightly curved; silk is generally preferred for this purpose.

In drawing the silk through, tie a knot, using the end of the silk, and that drawn through the edges, in such a manner as to prevent its untying or drawing out. The stitches should generally be about half an inch apart. When the wound has grown together, cut the silk and pull it out, each stitch separately. Wounds on the legs may be best drawn together by the use of bandages. The bandage slit into three or four strips at both ends is very convenient for drawing such wounds together. Keep the bandages clean by washing them once or twice a day, and bathe the wound three or four times a day in a carbolic lotion of one-half ounce carbolic acid mixed with one pint of soft water. When the wound is nearly closed, apply three times a day a mixture of one part carbolic acid, and eight parts of olive oil.

LIST OF MEDICINES,

WITH QUANTITY SUITED TO DIFFERENT ANIMALS.

The following list of medicines with the quantity suited to different farm animals is given by Dr. Law in his Veterinary Adviser, and may be found convenient for ready reference. Those marked by a star (*), will be found very useful to have always ready at hand. All medicines should be kept *well corked,* and all corrosive substances in strong glass bottles, with ground glass stoppers.

Acetic Acid, antidote to alkalies, cooling astringent: Horse 1 drachm; ox 2 drachms; ass 1 drachm; sheep 1 scruple; dog 2 to 3 drops.

Tincture of Aconite, sedative, diaphoretic: Horse 20 to 30 drops; ox 30 to 40 drops; ass 15 to 20 drops; sheep 3 to 5 drops; dog 1 to 3 drops.

Alcohol, stimulant, diuretic, narcotic: Horse 1 to 3 ounces; ox 3 to 6 ounces; ass 1 ounce; sheep ½ ounce; dog 2 drachms. Cooling astringent.

Brandy, Whisky, and Gin, stimulant, diuretic, narcotic: Horse 3 to 6 ounces; ox 6 to 12 ounces; ass 2 to 5 ounces; sheep 10 ounces; dog ½ ounce. Locally cooling astringent.

Strong Ale, stimulant, diuretic, narcotic: Horse 1 to 2 pints; ox 2 to 4 pints; ass 1 pint; sheep ½ pint; dog 2 ounces. Locally cooling astringent.

Barbadoes Aloes, purgative: Horse 4 drachms; ass 3 to 4 drachms; dog ½ drachm.

Cape Aloes, purgative: Horse 5 drachms; ass 4 to 5 drachms.

Alum, astringent: Horse 2 to 3 drachms; ox 3 to 4 drachms; ass 2 drachms; sheep ½ to 1 drachm; dog ½ to 1 scruple.

Ammonia, Liquid, diffusible stimulant, antispasmodic, antacid, diuretic: Horse ½ ounce; ox ½ to 1 ounce; ass 2 to 4 drachms; sheep ½ to 1 drachm; dog 10 drops. Locally blister.

Aromatic Ammonia, diffusible stimulant, antispasmodic, antacid, diuretic: Horse 1 to 2 ounces; ox 2 to 4 ounces; ass 1 to 2 ounces; sheep ½ to 1 ounce; dog 1 drachm. Locally blister.

* Carbonate of Ammonia, diffusible stimulant, antispasmodic, antacid, diuretic: Horse 2 to 4 drachms; ox 4 to 6 drachms; ass 2 drachms; sheep ½ to 1 drachm; dog 10 to 15 grains. Locally blister.

Muriate of Ammonia, stimulant, discutient, alterative, diuretic: Horse 2 to 4 drachms; ox 4 to 6 drachms; ass 2 drachms; sheep ½ to 1 drachm; dog 20 grains. Locally cooling discutient.

Acetate Ammonia, Solution, diaphoretic, diuretic, stimulant: Horse 2 to 3 ounces; ox 3 to 4 ounces; ass 2 ounces; sheep ½ to 1 ounce; dog 2 drachms.

Anise-seed, stomachic, carminative: Horse 1 ounce; ox 1 to 2 ounces; ass 1 ounce; sheep 2 to 4 drachms; dog 1 to 3 scruples.

Antimony, Tartarized (Tartar Emetic), emetic; Swine 5 grains; dog 2 to 4 grains. Sedative, diaphoretic: Horse 2 drachms; ox 2 to 4 drachms; ass 2 drachms; sheep 1 to 2 scruples; swine ½ to 1 grain; dog ¼ to ½ grain. Locally blister.

Areca Nut, vermifuge, tæniafuge: Horse 1 ounce; ox 1 ounce; ass 1 ounce; sheep 3 drachms; dog ½ to 1 drachm.

* Arnica, Tincture, stimulant, diuretic: Horse 1 drachm; ox 1 drachm; ass ½ drachm; sheep 1 scruple; dog 10 drops. Locally cooling, soothing.

Arsenic, alterative, nerve tonic: Horse 5 grains; ox 5 to 8 grains; ass 3 to 5 grains; sheep 1 grain; swine ½ grain; dog 1-12 grain. Locally caustic, parasiticide.

* Assafœtida, diffusible stimulant, carminative, vermifuge and appetizer: Horse 2 drachms; ox 4 drachms; ass 1 to 2 drachms; sheep ½ to 1 drachm; swine ½ drachm; dog 10 to 20 grains.

Azedarach, vermifuge: Horse ½ to 1 ounce; ox 1 ounce; ass 3 to 4 drachms; sheep 1 to 2 drachms; swine 1 drachm; dog 20 grains.

Belladonna, anodyne, antispasmodic, narcotic; Horse 2 ounces; ox 2 ounces; ass 1 to 2 ounces; sheep ½ ounce; dog 5 grains.

Belladonna, Extract, anodyne, etc.: Horse 2 drachms; ox 2 to 3 drachms; ass 1 to 2 drachms; sheep ½ drachm; dog 1 to 3 grains.

Atropia (alkaloid) of Belladonna, anodyne, etc.: Horse 1 to 2 grains; ox 1 to 2 grains; ass 1 grain; sheep ½ grain; dog 1-16 grain.

Balsam of Peru, stimulant, antispasmodic, expectorant: Horse 1 ounce; ox 1 to 1½ ounces; ass ½ to 1 ounce; sheep 2 drachms; dog ½ drachm.

Benzoin, stimulant, antispasmodic, expectorant: Horse 1 ounce; ox 1 to 1½ ounces; ass ½ to 1 ounce; sheep 2 drachms; dog ½ drachm.

Borax, nerve sedative, uterine stimulant: Horse 2 to 6 drachms; ox ½ to 1 ounce; ass 2 to 4 drachms; sheep ½ to 1 drachm; swine ½ drachm; dog 5 to 10 grains. Locally astringent, parasiticide.

Bismuth, Subnitrate, soothes irritation of the stomach and bowels: Horse 2 drachms; ox 2 to 4 drachms; ass 1 to 2 drachms; sheep 20 grains; swine 10 to 20 grains; dog 5 to 10 grains. Locally soothing, healing.

Blackberry Root, astringent; Horse 2 to 4 drachms; ox ½ ounce; ass 2 drachms; sheep 2 scruples; dog ½ scruple.

Blue-stone (Copper Sulphate).

Boneset, stimulant, tonic, diaphoretic: Horse ½ to 1 ounce; ox 1 ounce; ass ½ ounce; sheep 2 to 3 drachms; swine 2 drachms; dog ½ to 1 drachm.

Bromide Potassium, nerve sedative: Horse 2 to 4 drachms; ox 4 drachms: ass 2 to 3 drachms; sheep ½ drachm; dog 5 to 10 grains.

Buchu, stimulant, diuretic: Horse 4 drachms; ox ½ to 1 drachm; ass 3 drachms; sheep 1 drachm; dog 10 to 20 grains.

Buckthorn Syrup, purgative: dog ½ to 1 ounce.

Calomel, purgative: Horse 1 drachm; ox 1 to 2 drachms; ass 1 drachm; swine 1 scruple; dog 3 to 4 grains. Alterative: Horse 1 scruple; ox 1 to 3 scruples; ass 1 scruple; swine 3 to 4 grains; dog ½ to 1 grain.

Camphor, calmative, antispasmodic: Horse 1 to 2 drachms; ox 2 to 4 drachms; ass 1 drachm; sheep 1 scruple; dog 3 to 10 grains.

Cantharides, stimulant, diuretic; Horse 5 grains; ox 5 to 10 grains; ass 3 to 5 grains; sheep 1 to 2 grains; dog ⅙ to ⅓ grain. Locally blister.

Capsicum, Cayenne Pepper, stimulant, aromatic: Horse 2 to 3 drachms; ox 2 to 4 drachms; ass 1 to 2 drachms; sheep 1 scruple; swine ½ to 1 scruple; dog 2 to 5 grains. Locally irritant.

Caraway Seed, stomachic: Horse 1 ounce; ox 1 to 2 ounces; ass 1 ounce; sheep 2 to 3 drachms; swine 2 drachms; dog 1 scruple.

Cardamoms, stomachic: Horse 1 ounce; ox 1 to 2 ounces; ass 1 ounce; sheep 2 to 3 drachms; swine 2 drachms; dog 1 scruple.

Cascarilla, stimulant, bitter tonic: Horse ½ to 1 ounce; ox 1 ounce; ass 4 to 6 drachms; sheep 1 drachm; dog 10 grains.

Carbolic Acid, sedative, anodyne, astringent, antiseptic, disinfectant: Horse ½ to 1 drachm; ox 1 drachm; ass ½ drachm; sheep 10 drops; dog 5 drops.

Castor-oil, purgative: Horse 1 pint; ox 1 to 1½ pints; ass 1 pint; sheep 3 to 4 ounces; dog ½ to 1 ounce.

Catechu, astringent: Horse 2 to 5 drachms; ox 3 to 8 drachms; ass 2 to 3 drachms; sheep 1 to 2 drachms; dog 10 to 30 grains.

Chamomile, stimulant, tonic: Horse 1 ounce; ox 1 to 2 ounces; ass 1 ounce; sheep 2 drachms; dog ½ drachm.

Cherry Bark, wild, expectorant: Horse ½ ounce; sheep 2 to 3 scruples; swine 2 scruples; dog 1 scruple.

Chloral-Hydrate, sedative, antispasmodic: Horse ½ ounce; ass ½ to ½ ounce; sheep 1 drachm; dog 20 grains. Soporific: Horse 1 ounce; sheep 2 to 3 drachms; dog ½ drachm.

Chloroform, sedative, antispasmodic, stimulant: Horse 1 to 2 drachms; ass 1 drachm; sheep 1 scruple; dog 5 to 10 drops. Anæsthetic.

Cinchona, Peruvian Bark, bitter tonic, antiseptic, antiperiodic: Horse 1 to 3 ounces; ass 1 ounce; sheep 2 to 4 drachms; dog 1 drachm.

Cinnamon, stomachic; Horse 4 to 6 drachms; ox ½ to 1 ounce; ass 4 to 6 drachms; sheep 1 to 2 drachms; dog 10 to 20 grains.

Cod-liver Oil, tonic: Horse 4 to 6 ounces; ox 6 to 8 ounces; ass 4 to 6 ounces; sheep 1 to 2 ounces; dog ½ ounce.

Colchicum, diuretic, sedative: Horse ½ to 1 drachm; ox 1 to 2 drachms; ass ½ drachm; sheep ½ scruple; dog 2 to 8 grains.

Colocynth, bitter purgative: Dog 2 to 5 grains.

Columbo, bitter tonic: Horse 4 to 6 drachms; ox ½ to 1 ounce; ass 2 to 3 drachms; sheep ½ to 1 drachm; dog 10 grains.

Conium, Extract, sedative: Horse 1 drachm; ox 1 to 2 drachms; ass ½ to 1 drachm; sheep 10 to 15 grains; swine 10 grains; dog 2 to 5 grains.

Copaiva, stimulant, diuretic, expectorant: Horse 2 to 4 drachms; ox 3 to 4 drachms; ass 2 to 3 drachms; sheep ½ to 1 drachm; dog 10 drops.

Potassium Bromide, nerve sedative: Horse ½ ounce; ass 2 to 4 drachms; sheep 2 drachms; swine 1 drachm; dog 20 grains.

Potassium Cyanide, sedative, antispasmodic: Horse 1 to 2 grains; ox 2 grains; ass 1 to 2 grains; sheep ½ grain; dog ⅛ to ¼ grain.

Prussic Acid, sedative, antispasmodic: Horse 20 to 30 drops; ox 30 to 40 drops; ass 15 to 20 drops; sheep 5 to 8 drops; swine 5 drops; dog 1 to 3 drops.

Pumpkin Seeds, vermifuge, tæniafuge; Dog ½ ounce.

Quinia, Sulphate, bitter tonic: Horse 20 grains; ox 20 to 30 grains; ass 15 to 20 grains; sheep 6 to 10 grains; swine 5 to 10 grains; dog 2 to 6 grains.

Rhubarb, laxative, tonic: Horse 1 ounce; ox 2 ounces; ass 1 ounce; sheep 1 drachm; dog 20 grains.

Resin, diuretic: Horse 4 to 6 drachms; ox ½ to 1 ounce; ass 4 to 6 drachms; sheep 2 to 4 drachms; swine 2 drachms; dog 20 to 30 grains.

Soap, diuretic, antacid, laxative: Horse 1 to 2 ounces; ass 1 ounce; sheep 2 to 6 drachms; swine 2 to 4 drachms; dog 20 to 60 grains.

Soda, Bicarbonate, antacid, diuretic: Horse 4 to 6 drachms; ox 4 to 8 drachms; ass 4 drachms; sheep 1 to 2 drachms; dog 5 to 30 grains.

Ergot, checks bleeding, parturient; Horse ½ to 1 ounce; ox 1 ounce; ass ½ ounce; sheep 1 to 2 drachms; dog ½ drachm.

Ether, diffusible stimulant: Horse 1 to 2 ounces; ox 2 to 3 ounces; ass 1 ounce: sheep ½ ounce; swine 2 to 4 ounces; dog 1 drachm.

Fennel Seed, stomachic: Horse 1 ounce; ox 1 to 2 ounces; ass 1 ounce; sheep 2 to 4 drachms; dog ½ drachm.

Filix Mas., Extract, Male Shield-Fern, vermifuge, tæniacide: Horse 1 ounce; sheep ½ drachm; dog 10 to 20 drops.

Galls, Oak, astringent: Horse 4 to 6 drachms; ox 1 to 2 ounces; ass 4 drachms; sheep ½ to 1 scruple; swine 1 to 2 scruples; dog 1 to 3 grains.

Gallic and Tannic Acid, tannin, astringent: Horse 1 to 3 scruples; ass 1 to 2 scruples; sheep 5 grains; dog 1 to 3 grains.

Gentian, bitter tonic: Horse 4 drachms; ox ½ to 1 ounce; ass 4 drachms; sheep 1 to 2 drachms; dog 10 to 20 grains.

Ginger, stimulant, stomachic: Horse 1 ounce; ox 2 ounces; ass ½ to 1 ounce; sheep ½ ounce; swine 2 drachms; dog 2 scruples.

Glauber Salts (Soda Sulphate).

Henbane, Hyoscyamus, Extract, sedative, antispasmodic: Horse 2 drachms; ox 2 to 4 drachms; ass 1 to 2 drachms; sheep ½ to 1 drachm; swine ½ drachm; dog 5 grains.

Hemp, Indian, Extract, antispasmodic, soporific, narcotic: Horse ½ to 1 drachm; ass ½ drachm; sheep 10 to 15 grains; swine 5 to 10 grains; dog 1 to 2 grains.

Hydrocyanic Acid (Prussic).

Iodine, alterative, discutient: Horse 10 to 20 grains; ox 20 to 30 grains; ass 10 grains; sheep 5 to 10 grains; swine 5 grains; dog 1 to 3 grains.

Iodide of Potassium, alterative, diuretic: Horse ½ to 1 drachm; ox 1 to 2 drachms; ass ½ drachm; sheep 3 scruples; swine 1 to 2 scruples; dog 1 scruple.

Ipecacuanha, emetic, sedative: Swine 1 to 2 drachms; dog 15 to 20 grains. Diaphoretic, expectorant: Swine ½ drachm; dog 3 to 5 grains.

Jalap, purgative: Swine 1 to 2 drachms; dog ½ to 1 drachm.

Iron, Peroxide, tonic: Horse 2 to 4 drachms; ox 4 drachms; ass 2 drachms; sheep 1 drachm; dog 5 to 10 grains. Antidote to arsenic.

Iron, Sulphate, tonic: Horse 2 to 4 drachms; ass 2 drachms; sheep 1 drachm; swine ½ drachm; dog 2 to 5 grains.

Iron, Carbonate, tonic: Horse 2 to 4 drachms; ass 2 drachms; sheep 1 drachm; swine ½ drachm; dog 2 to 5 grains.

Iron, Iodide, tonic, discutient: Horse ½ to 2 drachms; ox 1 to 2 drachms; ass ½ to 1 drachm; sheep 15 to 30 grains; swine 10 to 20 grains; dog 1 to 8 grains.

Iron, Tincture of Muriate, astringent, checks bleeding: Horse ½ to 1 ounce; ox 1 to 2 ounces; ass ½ ounce; sheep ½ to 1 drachm; swine 10 to 30 drops; dog 5 to 16 drops.

Kino, astringent: Horse ½ ounce; ox ½ to 1 ounce; ass 2 to 4 drachms; sheep 1 to 2 drachms; swine ½ to 1 drachm; dog 10 grains.

Kousso, vermifuge: Sheep 2 to 3 ounces; dog 1 ounce.

Laudanum (Opium).

Copper, Ammoniated, tonic, antispasmodic, astringent: Horse 1 to 2 drachms; ox 1 to 2 drachms; ass 1 drachm; sheep 10 to 20 grains; dog 1 to 5 grains.

Copper, Iodide, tonic, discutient: Horse 1 to 2 drachms.

Copper, Sulphate, tonic, astringent: Horse ½ to 1 drachm; ox 1 to 2 drachms; ass ½ drachm; sheep 10 grains; dog 2 to 4 grains.

Croton Seeds, purgative: Horse 10 to 12; ox 15 to 20; ass 8 to 10; sheep 2 to 3; dog 1 to 2.

Croton Oil, purgative: Horse 15 to 20 drops; ox 20 to 30 drops; ass 12 to 18 drops; sheep 5 to 8 drops; dog 3 to 4 drops.

Cream of Tartar, diuretic: Horse 1 ounce; sheep 4 to 6 drachms; dog 1 drachm. Laxative: Horse 5 ounces; ox 5 to 8 ounces; ass 5 ounces; sheep 1 to 2 ounces; dog ½ ounce.

Dandelion Extract, Taraxacum, diuretic, laxative, bitter: Horse 1 to 1½ ounces; ox 2 ounces; ass 1 ounce; sheep 3 drachms; dog 1 drachm.

Digitalis, sedative, diuretic; Horse 15 to 20 grains; ox ½ to 1 drachm; ass 15 grains; sheep 5 to 15 grains; swine 2 to 10 grains; dog 1 to 3 grains.

Dover's Powder, sedative, diaphoretic; Horse 3 drachms; ox 3 to 4 drachms; ass 2 drachms; sheep 2 scruples; swine 1 scruple; dog 2 to 4 grains.

Mercury with Chalk, Hydrargyrum Cum Creta, antacid, laxative: Calf 10 to 15 grains; dog 5 to 10 grains.

Mercurial Pill, Blue Pill, laxative: Dog 5 grains.

Mercury, Subchloride (Calomel).

Muriatic Acid, Hydrochloric Acid, tonic, astringent, caustic, disinfectant: Horse 1 drachm; ox 2 drachms; ass 1 drachm; sheep 20 drops; dog 2 to 5 drops.

Myrrh, stimulant, tonic: Horse 2 to 4 drachms; ox 4 to 6 drachms; ass 2 drachms; sheep 1 to 2 drachms; dog 5 to 20 grains.

Nitre (Potassa Nitrate).

Nitric Acid, tonic, astringent, caustic: Horse 1 drachm; ox 2 drachms; ass 1 drachm; sheep 20 drops; dog 2 to 5 drops.

Nux Vomica, nerve stimulant, tonic: Horse 10 to 30 grains; ox 20 to 40 grains; ass 10 to 20 grains; sheep 5 to 15 grains; dog ½ to 3 grains.

Oak Bark, astringent: Horse 1 ounce; ox 2 to 4 ounces; ass 1 ounce; sheep 4 drachms; swine 2 to 3 drachms; dog 1 to 2 drachms.

Olive Oil, laxative: Horse 1 to 2 pints; ox 2 to 3 pints; ass 1 pint; sheep 3 to 6 ounces; dog 1 to 3 ounces.

Opium, narcotic, sedative, anodyne, antispasmodic: Horse ½ to 2 drachms; ox 2 to 4 drachms; ass ½ to 1 drachm; sheep 10 to 12 grains; dog ½ to 3 grains.

Opium, Tincture, Laudanum, narcotic, sedative, anodyne, antispasmodic: Horse 1 to 2 ounces; ox 2 ounces; ass ½ to 1 ounce; sheep 2 to 3 drachms; dog 15 to 30 drops.

Morphia, Muriate, narcotic, sedative, anodyne, antispasmodic: Horse 3 to 5 grains; ox 5 to 10 grains; ass 3 grains; sheep ½ to 1 grain; dog ¼ to ½ grain.

Pepperment Oil, stomachic, antispasmodic: Horse 20 drops; ox 20 to 30 drops; sheep 5 to 10 drops; swine 5 drops; dog 3 to 5 drops.

Peruvian Bark (Cinchona).

Pepper, Black, White, stomachic, stimulant: Horse 2 drachms; ox 3 drachms; ass 2 drachms; sheep 1 to 2 scruples; dog 5 to 10 grains.

Pimento, stomachic, stimulant: Horse 2 drachms; ox 3 drachms; ass 2 drachms; sheep 1 to 2 scruples; dog 5 to 10 grains.

Podophyllin, purgative, sedative: Horse 1 to 2 drachms; ox 2 drachms; ass 1 drachm; sheep 10 to 20 grains; swine 6 to 8 grains; dog 1 to 2 grains.

Pomegranate Root Bark, vermifuge: Horse 1 ounce; ox 1 to 2 ounces; ass 1 ounce; sheep 2 to 3 drachms; swine 1 to 2 drachms; dog 20 to 30 grains.

Potassa Acetate, antacid, diuretic, diaphoretic: Horse 6 to 8 drachms; ox 1 ounce; ass 4 to 6 drachms; sheep 1 to 2 drachms; dog 10 to 20 grains.

Potassa Nitrate, diuretic, febrifuge: Horse 6 to 8 drachms; ox 1 ounce; ass 4 to 6 drachms; sheep 1 to 2 drachms; dog 10 to 20 grains.

Potassa Bicarbonate, antacid, diuretic: Horse 6 to 8 drachms; ox 1 ounce; ass 4 to 6 drachms; sheep 1 to 2 drachms; dog 10 to 20 grains.

Potassa Chlorate, stimulant, diuretic, refrigerant, antiseptic: Horse 1 to 4 drachms; ass 1 to 2 drachms; sheep 20 to 40 grains; dog 5 to 15 grains.

Potassium Iodine (Iodine).

Lead Acetate (Sugar of Lead), astringent, sedative: Horse 1 to 2 scruples; ox 2 to 3 scruples; ass 1 scruple; sheep 10 to 15 grains; dog 2 to 5 grains.

Lime-water, antacid, astringent: Horse 4 to 5 ounces; ox 4 to 8 ounces; ass 4 ounces; sheep 1 ounce; dog 1 drachm.

Lime, Carbonate, Chalk, antacid, astringent: Horse 1 to 2 ounces; ox 2 to 4 ounces; ass 1 ounce; sheep 2 to 4 drachms; dog 8 to 12 grains.

Lime, Chloride, Chlorinated, checks tympany, disinfectant: Horse 2 to 4 drachms; ass 2 drachms; sheep 1 to 2 drachms.

Linseed Oil, laxative: Horse 1 to 2 pints; ox 1 to 2 quarts; ass 1 pint; sheep ½ pint.

Lobelia sedative, antispasmodic, expectorant: Horse 1 to 2 drachms; ox 1 to 3 drachms; ass 1 drachm; sheep 15 grains; swine 5 to 15 grains; dog 1 to 5 grains.

Magnesia, antacid, laxative, antidote to arsenic: Horse 1 to 2 ounces; ox 2 to 4 ounces; sheep 1 ounce.

Magnesia, Sulphate, Epsom Salts, laxative: Ox 1 to 2 pounds; sheep 4 to 6 ounces.

Mallow, demulcent: Freely.

Mentha Piperita (Peppermint).

Soda, Sulphite, Bisulphite, Hyposulphite, antiseptic, disinfectant, alterative, relieves tympany: Horse 1 ounce; ox 2 to 3 ounces; ass 1 ounce; sheep 2 to 6 drachms; swine 2 to 4 drachms; dog 20 to 60 grains.

Soda Sulphate (Glauber Salts), purgative: Horse 1 to 1½ pounds; ox 1 to 2 pounds; ass ½ to 1 pound; sheep 6 ounces.

Sodium, Chloride (common salt), tonic, vermifuge, purgative: Horse 1 to 2 ounces; ox 2 to 4 ounces; ass 1 ounce; sheep 2 to 4 drachms; swine 1 to 3 drachms; dog 10 to 30 grains.

Santonin, Wormseed, Semen Contra, vermifuge: Horse ½ to 1 ounce, ass 4 drachms; sheep 2 to 4 drachms; swine 1 to 3 drachms; dogs 10 to 60 grains.

Squill, diuretic, expectorant: Horse ½ drachm; ox ½ to 1 drachm; ass 20 to 30 grains; sheep 10 to 15 grains; dog 1 to 5 grains.

Silver, Nitrate (Lunar Caustic), nerve tonic: Horse 5 grains; ox 5 to 8 grains; ass 2 to 4 grains; sheep 1 to 2 grains; dog ¼ to ½ grain.

Spanish Flies (Cantharides).

Spigelia, vermifuge: Horse ½ to 1 ounce; ox 1 to 2 ounces; ass ½ to 1 ounce; sheep 2 to 4 drachms; swine 2 to 3 drachms; dog 1 drachm.

Strychnia, nerve tonic: Horse 1 to 2 grains; ox 1 to 3 grains; ass 1 grain; sheep ⅛ to 1 grain; swine ⅛ grain; dog 1-40 to 1-10 grain.

Sulphur, expectorant, diaphoretic: Horse 3 to 4 ounces; ox 5 to 6 ounces; ass 3 ounces; sheep 2 ounces; swine 1½ to 2 ounces; dog 2 to 8 drachms. Laxative, alterative: Horse 1 ounce; ox 1 to 2 ounces; ass 1 ounce; sheep 6 drachms; dog ½ to 1 drachm. Parasiticide.

Sweet Spirits of Nitre, Spirit of Nitrous Ether, stimulant, antispasmodic, diuretic, diaphoretic: Horse 1 to 2 ounces; ox 3 to 4 ounces; ass 1 ounce; sheep 3 to 6 drachms; dog ½ to 2 drachms.

Stramonium, narcotic, sedative: Horse 20 to 30 grains; ox ½ to 1 drachm; ass 15 to 30 grains; sheep 5 to 10 grains; swine 4 to 6 grains; dog 2 grains.

Sulphuric Acid, tonic, refrigerant, caustic: Horse 1 drachm; ox 2 to 4 drachms; ass 1 drachm; sheep ½ drachm; swine 20 drops; dog 5 to 10 drops.

Tobacco, sedative, antispasmodic, vermifuge: Horse 4 drachms; ox 4 to 6 drachms; ass 4 drachms; sheep 1 drachm; swine ½ drachm; dog 5 to 6 grains.

Tar, expectorant, antiseptic: Horse ½ to 1 ounce; ox ½ to 2 ounces; sheep ½ ounce.

Turpentine Oil, stimulant, antispasmodic, diuretic: Horse 1 to 2 ounces; ox 1 to 1½ ounces; ass ½ ounce; sheep 4 to 6 drachms; swine 1 drachm; dog ½ drachm. Vermifuge: Horse 2 ounces; ox 2 to 3 ounces; ass 1 to 2 ounces; sheep 4 drachms; swine 2 to 3 drachms.

Valerian, diffusible stimulant, antispasmodic, vermifuge: Horse 2 ounces; ox 2 to 4 ounces; ass 2 ounces; sheep ½ ounce; swine 2 to 3 drachms; dog 1 to 2 drachms.

Valerianate of Iron, nerve tonic: Dog 4 to 5 grains.

Veratrum, sedative: Horse 1 scruple; ox ½ to 1 drachm; ass ½ to 1 scruple; sheep 5 to 10 grains; swine 5 to 8 grains; dog 2 grains.

Wild Cherry Bark, expectorant: Horse 1 ounce; ox 1½ ounce; ass 1 ounce; sheep 3 drachms; dog 30 grains.

Zinc, Carbonate, astringent, tonic: Horse 2 drachms; ox 2 to 4 drachms; ass 2 drachms; sheep ½ to 1 drachm; swine ½ drachm; dog 10 to 15 grains.

Zinc, Sulphate, astringent, tonic: Horse 1 to 2 drachms; ox 2 to 3 drachms; ass 1 drachm; sheep 15 to 30 grains; swine 10 to 15 grains; dog 2 to 3 grains. Emetic: Swine 15 grains to 1 drachm; dog 8 to 15 grains.

GLOSSARY OF TERMS.

The following glossary of terms may be found convenient for reference in connection with the description of diseases, their remedies, etc.

Abnormal—Irregular.
Absorbents—Medicines used for absorbing; also the vessels of the body which suck up.
Acute—Sharp, severe.
Adipose—Fatty.
Adynamic—Debilitated.
Alæ—Wings.
Alteratives—Medicines which change a disease for the better.
Anasarca—Dropsy of cellular membrane.
Anasarcous—Dropsical.
Anæmia—Bloodlessness.
Antiseptics—Medicines opposed to putrefaction.
Antispasmodic—Remedies opposed to spasms or convulsions.
Antiphlogistic—Opposed to inflammation.
Aperients—Medicines which open the bowels gently.
Aqueous—Watery.
Ascites—Dropsy of the belly.
Ataxic—Disordered.
Auscultation—Examination by sounding and listening.
Autopsy—Post-mortem examination.
Bifurcation—Division into two branches.
Bolus—A large pill.
Buccal Membrane—The lining of the mouth.
Canthus—Corner of the eye.
Capsule—Shell or case.
Carbonaceous—Containing carbon.
Carminatives—Medicines which relieve pain by expelling wind from the bowels.
Cartilaginous—Composed of cartilage.
Cathartic—Loosening.
Cellular—Cell-like.
Cerebellum—The brain.
Cerebrum—The brain.
Chancrous—Cancerous.
Clinical—Relating to individual practice.
Coma—Stupor.
Comatose—Stupefied.
Conjunctival Membrane—The membrane which lines the eyelids and covers the eyeball.
Cornea—Transparent coat of the eye.
Cranial—Pertaining to the skull.
Cranium—Skull.
Crucial—Shaped like a cross.
Decarbonize—To purify the air.
Diagnosis—The art of telling the nature of diseases.
Diaphoretics—Medicines which promote perspiration.
Diathesis—Predisposition to certain diseases.
Dietetics—Regulation of diet.
Diuretics—Medicines which increase the flow of urine.
Duct—Canal.
Dynamic—Relating to the vital forces.
Emollients—Substances used to reduce inflammations.
Emphysema—Distention by gas or wind of certain portions of the body.
Emunctories—Organs which carry off waste matters.
Encephalon—The brain.
Enema—Injection.
Enzootic—Endemic diseases among animals.
Epizootic—Epidemic among animals.
Equilibrium—Balance.
Equine—Relating to the horse.
Etiology—The doctrine of the cause of diseases.
Excrementitious—Useless.
Excretory—Relating to vessels which throw off useless matter.
Extravasation—Escape of a fluid of the body from its vessel into surrounding parts.
Exudation—Oozing through a membrane.
Fauces—The throat.
Fleam—An instrument used in bleeding.
Graminivorous—Feeding on grass.
Hemalosine—The red coloring matter of the blood.
Hemorrhage—Bleeding.
Hippiatric—Relating to diseases of the horse.
Histology—General anatomy.
Hydrocephalus—Water in the head.
Hygiene—Preservation of health.
Ichorous—Humory.
Idiopathic—Primary affections.
Idiosyncrasy—Peculiarity of constitution.
Indurated—Hardened.
Inguinal—Belonging to the groin.
Intercostal—Between the ribs.
Inunction—The art of rubbing in.
Lachrymal Glands—Those which secrete tears.
Lancinating—Shooting.
Laxatives—Loosening medicines.
Lesion—Disorder.
Ligament—The substance which joins bones together.
Mammæ—Breasts.
Masseters—Muscles of the jaws.
Morbid—Diseased.
Morbific—Producing disease.
Navicular—One of the bones of the foot.
Neuro-pathology—The nervous system in disease.
Nodulous—Like a knot.
Nosology—Classification of diseases.

Œdematous—Swollen.
Opaque—Not transparent.
Os calcis—Bone of the heel.
Osseous—Bony.
Ovoid—In the form of an egg.
Palatine—Relating to the palate.
Panzootic—An epidemic affecting animals generally.
Parasite—An animal which lives on another.
Parotid—Largest salivary gland.
Pathology—The study of the body in disease.
Pedicle—Narrow part of a tumor.
Petechial—Resembling flea-bites.
Phthisis—Wasting away.
Pituitary Membrane—Lining of the nostrils.
Pseudo-Membranous—Relating to false membranes.
Pus—Matter.
Pylorus—Entrance into intestines.
Rale—A watery sound heard in sounding the chest in some diseases.
Sanative—Health-giving.
Schneiderian Membrane—The lining of the nostrils.
Sebaceous—Of the nature of suet.
Sedatives—Medicines which produce sleep.
Serous—Watery.
Serum—Watery part of the blood.
Solvent—That which dissolves.
Sporadic—Scattered.
Submaxillary—Beneath the jaw.
Sudamina—Small eruptions.
Supra-renal—Above the kidney.
Thoracic—Relating to the chest.
Thyroid—Shaped like a folding door.
Tonics—Medicines which give tone and strength to the body.
Tubercular—Relating to tumors in the structure of an organ.
Tumefaction—Swelling.
Turbinated Bones—Bones of the nose shaped like a top.
Turgescence—Great amount of humors in any part.
Vascular—Full of blood-vessels.
Ventricle—Cavity.
Virus—Poison.
Vis a Fronte—Force from the front.
Vis a Tergo—Force of propulsion.
Viscous—Sticky.
Voice-box—Larynx.

THE DAIRY.

THE dairy industry has assumed vast proportions in the United States within the last decade; and it may, perhaps, be safe to say that it has made more rapid progress within the last ten years than any other branch of agriculture, embracing, as it does, a wide range of labor, and requiring a great diversity of skill and intellect to insure its most successful advancement. No other country in the whole world contains such natural resources as our own, and when we consider the advancement already made in this department of agriculture alone, and the wide field that lies beyond, almost unexplored, we can justly regard the dairy industry as in its infancy, as well as one of the principal branches of agriculture upon which the future success and prosperity of the whole country shall find the elements of a substantial basis. That the dairying interest of this country is one of vast and increasing magnitude, will be seen by the following reports and estimates on dairy stock and dairy products:

In 1840 the number of milch cows in the United States was estimated at 4,837,043; in 1850, 6,385,094; in 1860, 8,728,863; in 1870, 11,000,000; and in 1880, 12,442,137. The production of butter in 1850 was estimated at 313,250,000 lbs.; in 1860, 469,750,000 lbs., in 1870, 600,000,000 lbs., while the annual butter product of 1880 has been variously estimated at from 1,000,000,000 to 1,400,000,000 pounds, nearly all of which was consumed at home, the exported product being estimated at only 39,236,658 lbs.

In 1860 the production of cheese in the United States was reported to be 103,750,000 lbs.; in 1870, 275,000,000 lbs.; in 1880, 400,000,000 lbs. In 1860 the cheese exported from this country amounted to 15,750,000 lbs.; in 1870, 70,000,000 lbs.; and in 1880, 127,553,907 lbs. Notwithstanding the rapid advancement and growth of dairy husbandry in the United States, the supply of dairy products is quite unequal to the demand; those which are first class in quality being standard articles throughout the whole civilized world, and will always be in demand, and command remunerative prices.

The American dairy belt and the characteristics of a good dairy country are thus defined by the late Prof. X. A. Willard, who has probably given more attention to the subject of dairying than any other writer on this subject in the country:

"The great American dairy belt lies between the fortieth and forty-fifth parallels of latitude. It stretches from the Atlantic to the Mississippi, and possibly to the Pacific. Within its limits are New England, New York, Pennsylvania, the northern parts of Ohio, Illinois, and Indiana, the greater portion of Michigan, Wisconsin, Iowa, and Minnesota, and a part of the Canadas. Of all this belt probably not more than a third of the land is adapted to dairying. The dairy lands are quite irregular in outline, lying not always continuously together, but often detached, and not unfrequently, if represented on the map, would have the appearance of islands.

The characteristics of a good dairy country are, high, undulating surfaces; numerous springs and streams of never-failing water; a soil retentive of moisture; a sweet and nutritious herbage, that springs up spontaneously and continues to grow with great tenacity; a rather low average temperature; frequent showers, rather than periodical drouths, and sufficient covering of the ground in winter to protect grass roots, so that the herbage may be permanent and enduring.

Doubtless within the limits of the United States, on high table lands, or on the lower slopes of mountainous ranges, there are soils eminently adapted to dairying; but we have no large and continuous stretch of country, like that to which we have referred, where the business naturally would develop itself into a specialty."

Milk and its Composition.—Successful dairying, as with every other kind of busi-

ness, requires certain essentials, in the knowledge and practice of which its highest possibilities may be attained. These essentials may, perhaps, be briefly summarized in a knowledge of the nature of milk and its treatment in various relations; its manufacture into different dairy products, their care and preservation; a knowledge of the art of successful breeding,—breeding for a specific object; the management of dairy cattle in health and disease; the production of their food, etc.

Milk is the liquid secreted by the mammary glands of female mammalia for the nourishment of their young, and although the milk of each species of animals of this order has its peculiarities, differing somewhat from that of every other species, it is always a white, opaque fluid, sometimes of a bluish and sometimes of a yellowish tint, having a slight, agreeable odor and sweet taste. It contains a fatty substance, which forms butter; casein, which forms cheese, and a watery residuum, called serum or whey, in the manufacture of cheese.

The fatty globules, commonly known as butter globules, are generally round in form and of unequal size, varying from $\frac{1}{800}$ to $\frac{1}{250}$ of a line in diameter. Under the microscope they are seen to float about in the serum or watery portion of the milk. They are so very minute that they readily filter through the finest paper. The fatty or butyraceous matter in milk varies, according to its richness, from two and a half per cent. to six and a half per cent. or more of its weight; the caseous or cheesey matter from three to ten per cent., and the watery or serous matter called "whey," from eighty to ninety per cent. When milk is permitted to stand undisturbed for a time, the fat or butter globules rise to the top and form a layer of cream; this separation of fat and serum is, however, never complete, each retaining a portion of the other.

If cream rose to the surface of milk entirely free from other elements, it would appear in the form of pure butter, and would not require the process of churning to separate it from the other matter which it contains. A high temperature hastens the separation of the caseous matter or curd from the whey. This separation sometimes takes place so rapidly from the effects of great heat or sudden changes in the atmosphere that sufficient time is not allowed for the butter globules to rise to the top, and hence they become mixed with the curd. Milk, upon standing, separates into curd and whey, becoming sour by the change of its sugar of milk into an acid known as lactic acid. It is owing to the presence of this sugar, and the chemical changes that take place in consequence, that milk undergoes the different degrees of fermentation. An intoxicating liquor may be made from milk by fermenting it, followed by distillation, which produces pure alcohol.

The Tartars and Arabs make much of their spirituous liquors in this way from camel's milk.

Relative Nutritive Value of Milk.—It will be seen by a cursory examination of the following table, given by Dr. Bellows, that milk, as an article of food, is not usually rated at its actual worth. It gives the comparative nutritive value of several articles of food in their natural state, and will be found convenient for reference and comparison:

THE RELATIVE NUTRITIVE VALUE OF MILK.

	NITRATES.	CARBONATES.	PHOSPHATES.	WATER.
Milk of Cow, ...	5.0	8.0	1.0	86.0
Beef, ...	15.0	30.0	5.0	50.0
Lamb, ...	11.0	35.0	3.5	50.5
Mutton, ...	12.5	40.0	3.5	44.0
Pork, ...	10.0	50.0	1.5	38.5
Codfish, ...	14	very little.	5 to 6	79
Trout, ...	17	very little.	5 to 6	75
White of eggs, . . .	15½	none.	4½	80

It appears that milk contains all the elements of nutrition, the nitrates, carbonates, and phosphates, and is more wholesome than meats like pork and veal, which may jointly be looked upon with suspicion, more frequently than they are by their consumers. It should be more extensively used than it is in hot weather, especially in the diet of children, since it supplies the material for building up the bones and the muscles to a much greater degree than many other articles of food in common use. We would not wish to be understood as advising substituting milk wholly for meat in any system of diet; but if a smaller quantity of meat were used, and a larger quantity of pure, sweet milk than commonly forms the diet of our people generally, a higher standard of health would doubtless be the result.

Analysis of Milk.—A chemical analysis of cow's milk shows the presence of butter globules composed of various fats; nitrogenous matter, which includes albumen and casein; sugar of milk, and the ash elements; certain volatile oils, gases, etc. Besides these elements there are occasionally found various organic forms.

Prof. James Law gives an account of the passage of fungi spores from the blood of animals, and their appearance in the milk. The following is an analysis of cow's milk, as given by Haidleu:

ANALYSIS OF MILK.

Water, ...	87.3	Phosphate of magnesia, . .	.042
Butter, ...	3.	Phosphate of Iron, . . .	.007
Casein, ...	4.82	Chloride of Potassium, . .	.144
Sugar, ...	4.39	Chloride of Sodium, . . .	.024
Phosphate of lime, . . .	.23	Soda combined with cream, . .	.042

The quantity and quality of milk furnished by cows varies with the breed, the age of the cow, the age of the calf, the food, and the general treatment the animal receives, etc. The yield of milk diminishes as the calf grows older.

By experiments to ascertain the proportionate diminution of yield, it has been found that the total yield of a fair milker for the first fifty days after the birth of the calf was 1,200 quarts, or at the average rate of 24 quarts per day; for the second fifty days, 1,000 quarts, or 20 quarts per day; third, 700 quarts, or 14 quarts per day; fourth, 400 quarts, or 8 quarts per day; fifth, 400 quarts, or 8 quarts per day; sixth, 300 quarts, or 6 quarts per day; the total yield for ten months being 4,000 quarts, or about 8,000 pounds of milk.

Difference in Quality of One Milking.—It is commonly known that the milk that is last drawn from the udder of the cow in milking is much richer in cream elements or butter globules, than that which is first drawn. The reason usually given for this is the same as that which causes the cream to rise to the surface when set in an open vessel; the butter globules, of which the cream is largely comprised, being lighter than milk they rise and remain at the top. But we think there is a more natural way of accounting for the last part of the milk being the richest.

The udder of the cow, which is the more immediate receptacle of milk, and in which other milk-vessels terminate, is divided into two sections, each of which is subdivided into two others, thus making four divisions, each of which is in itself to a certain extent an organ of milk secretion. The lateral section, or that comprising the two hind teats, usually secretes larger quantities of milk, and is usually larger than the front section. These sections are not a continuous cavity or sack like a bladder, being composed of an immense number of small cavities or reservoirs for holding milk, varying in size from those so minute that a microscope would be necessary to distinguish them, to those of a large sized pea. These small cavities, which are only enlargements of the milk tubes in the udder, are to a certain extent distinct from each other, yet in a measure connected, the same as the blood vessels. All the milk veins and tubes in each quarter of the udder finally come together and terminate in a single tube in the teat.

The milk of each section, as it is secreted, naturally moves through the milk veins in the direction of the teat. The walls of these milk veins and cavities are always collapsed and in contact, when not distended with milk; with this constant inclination to a collapsed condition, it is very apparent that a liquid would force its passage through them much more easily than a solid, hence the cream globules, being solid particles of fat, would not make their passage along the ducts as readily as the liquid portion, and would naturally be left behind in the passage to the teat, consequently the last part of the milking would contain the most cream. The larger the cream globules, of course the more difficulty they would meet in moving along in the milk tubes, and the greater would be the difference in the quality of the milk between the first and last of the milking; hence in such breeds as the Channel Island cows, which are noted for milk containing large butter globules, there is a greater difference between the first and last of a milking, than in the milk of such breeds as the Holstein, in which the globules are comparatively small.

Schubler found by experiment that in dividing the milk at a milking into five equal parts, the first portion produced 5 per cent. of cream; the second 8 per cent.; the third 11.5 per cent.; the fourth 13.5 per cent.; fifth or last 17.5 per cent.; the average being 11 per cent. It will be seen by the above experiment, that in this case the last of the milking contained considerably more than three times the amount of cream than the first. In many cows the difference would doubtless be greater than this. This difference in the quality of milk at the same milking, shows that the custom which prevails in some countries of driving cows from house to house, and supplying their customers with milk warm and fresh from the udder, would result in furnishing the customers last served, with milk of a much richer quality than the first.

Selecting Cows for the Dairy.—With the dairyman, the cow is the machine that manufactures the staple of his dairy products. As the manufacturer of cotton, woolen, or any other kind of fabric finds it for his very highest interest in business to select the very best machinery for the making of his goods, it is quite as important that the dairyman use especial care in the selection of his herd of cows, since it is in this way alone that the most satisfactory results both in quality and quantity can be attained, while it costs no more to maintain good and profitable cows than poor ones. Notwithstanding each breed has its own peculiar characteristics (which have already been described in this work), it is a well known fact, that individuals of a breed differ very materially with respect to milk production, both in the amount produced and the quality; and the dairyman who depends upon breed alone, without regard to a judicious selection, must unavoidably meet with disappointment.

While each breed has its own peculiar marks by which it may be distinguished from all others, there are certain points that cannot be overlooked, and which all good milkers possess to a greater or less extent. Thus we have different systems of classifying dairy stock such as those adopted by Pabst, Magne, Guenon, and others. No single mark, however well developed, can invariably be depended upon as a sure indication of extraordinary milking powers, but when several of the external marks of a great milker are found combined in a single animal, they may, as a general rule, be relied upon with a good degree of certainty.

In fact, it is claimed by some that a system so complete may be established that one versed in it will be enabled to go into a herd and select the best cows, those of a medium quality, and the worthless animals, in a very short time, and can determine with a good degree of certainty about how many quarts of milk the animal will produce daily, the quantity of butter it will make, about how long a time she will continue to give milk after calving, whether the calf will be profitable to keep, or whether it should be sent to the butcher; also whether the bull will get good dairy stock. To attain this skill in selection will of course require close observation and experience, but if such a system could be

established and made so clear and simple as to come within the ready comprehension of every one, it would prove of immense and incalculable value.

After determining the age of a cow, the constitution and health of the animal should next be considered. A good constitution is usually accompanied with good lungs, a chest that is broad, ribs broad and well spread, slow and regular respiration, and a good appetite. When such a cow is in milk she will require considerable water, as a large secretion of milk usually induces a strong inclination to drink; the digestive organs will be active and energetic, and an abundance of good, healthy blood will be manufactured, which will result in the milk glands being stimulated to large secretion. When not giving milk, such cows will fatten readily.

Cows with small and weak lungs, poor appetite, close ribs, and active milk glands, will generally possess a feeble constitution; and if they give a plentiful supply of milk, it will generally be of bad quality. Such cows are apt to have diseased lungs. They will never fatten readily when dry, however well they may be fed. As a general rule, dairymen regard the large breeds and heavy milkers, such as the Holsteins, best adapted to the manufacture of cheese, such milk containing the largest proportionate amount of casein, or cheese element, while the smaller breeds, giving a less quantity of milk but of richer quality, or more of the butter element, such as the Jersey and Guernsey, are best suited to the production of butter.

Some of the external marks of a good milker are given as follows, by the editor of this work in his "Milch Cows." In order to have no superfluous flesh, the cow should have a small, clear, and rather long head, tapering towards the muzzle. A cow with a large, coarse head will seldom fatten readily, or give a large quantity of milk. A coarse head increases the proportion of weight of the least valuable parts, while it is a sure indication that the whole bony structure is too heavy. The mouth should be large and broad; the eye bright and sparkling, but of a peculiar placidness of expression, with no indication of wildness, but rather a mild and feminine look. These points will indicate gentleness of disposition. Such cows seem to like to be milked, are fond of being caressed, and often return caresses.

The horns should be small, short, tapering, yellowish, and glistening. The neck should be small, thin, and tapering towards the head, but thickening when it approaches the shoulder; the dewlaps small. The fore-quarters should be rather small when compared with the hind-quarters. The form of the barrel should be large, and each rib should project farther than the preceding one up to the loins. She should be well formed across the hips and in the rump. The spine or back-bone should be straight and long, rather loosely hung, or open along the middle part, the result of the distance between the dorsal vertebrae, which sometimes causes a slight depression or sway back. By some good judges this mark is regarded as of great importance, especially when the bones of the hind-quarters are also rather loosely put together, leaving the rump of great width, and the pelvis large, and the organs and milk-vessels lodged in the cavities largely developed.

The skin over the rump should be large and flexible. This point is of great importance; and as, when the cow is in low condition, or very thin in flesh, it will appear somewhat harder and closer than it otherwise would, some practice and close observation are required to judge well of this mark. The skin all over the body should be soft and mellow to the touch, with soft, glossy hair. The tail, if thick at the setting on, should taper, and be fine below. But the udder is of special importance. It should be large in proportion to the size of the animal, and the skin thin, with soft, loose folds extending well back, capable of great distension when filled, but shrinking to a small compass when entirely empty. It must be free from lumps in every part, and of medium size.

Nor are the milk-veins less important to be carefully observed. The principal ones under the belly should be large and prominent, and extend well forward to the navel, losing

themselves apparently, in the very best milkers, in a large cavity in the flesh, into which the end of the finger can be inserted; but when the cow is not in full milk, the milk vein, at other times very prominent, is not so distinctly traced; and hence, to judge of its size when the cow is dry or nearly so, this vein may be pressed near its end, or at its entrance into the body, when it will immediately fill up to its full size. This vein does not carry the milk to the udder, as some suppose, but it is the channel by which the blood returns; and its contents consists of the refuse of the secretion, or what has not been taken up in forming milk.

There are also veins in the udder, and the perineum, or the space above the udder, and between that and the buttocks, which it is of special importance to observe. These veins should be largely developed and irregular or knotted, especially these of the udder. They are largest in great milkers. The knotted veins of the perineum extending from above, downwards in a winding line, are not readily seen in young heifers, and are very difficult to find in poor cows, or cows of only a medium quality. They are easily found in very good milkers, and, if not at first apparent, they are made so by pressing upon them at the base of the perineum, when they swell up, and send the blood back towards the vulva. They form a kind of shield net-work under the skin of the perineum, raising it up somewhat, in some cases near the vulva, in other cases lower down and nearer to the udder. It is important to look for these veins, as they often form a very important guide, and by some they would be considered as furnishing the surest indications of the milking qualities of the cow.

Their full development almost always indicates an abundant secretion of milk; but they are far better developed after the cow has had two or three calves, when two or three years' milking has given full activity to the milk glands, and attracted a large flow of blood. The larger and more prominent these veins, the better. It is needless to say that in observing them some regard should be had to the condition of the cow, the thickness of skin and fat by which they may be surrounded, and the general activity and food of the animal. Food calculated to stimulate the greatest flow of milk will naturally increase these veins, and give them more than usual prominence.

Magne states that in Flanders, a cow is considered a good milker, "especially when towards the middle of the spine the apophyses (or projections) are separated or scattered so as to leave a space between of about two finger-breadths," for the reason that, when the spine is thus formed, the haunches are better spread, and the thighs and croup larger. The other members of the body in such cases are also better developed, the basin ampler, and the organs placed in this cavity, as well as the udder, are more voluminous. Besides the parts already mentioned, much can also be determined by an examination of the escutcheon, or what is called the milk-mirror in cows.

The Guenon System.—This system is so called from the name of its founder, whose discovery, whatever may be said of it, has proved of vast importance to agriculture. Francis Guenon was a herdsman in France, a man of great judgment and penetration, a close observer, and an excellent judge of stock. He was born in Bordeaux, in humble circumstances, and in early life had the care of cows. He noticed upon the posterior of cows, on the space above the udder extending to the buttock, and called the perineum, that part of the hair grew contrary to the hair on the remaining part of the animal, and that the surface thus covered varied, assuming different shapes, and that a connection existed between these external marks and certain ones on the udder, and the milking qualities of the cow. To these marks he gave the name of milk mirror or escutcheon. By these marks, according to Guenon's system, it is claimed that not only the milking qualities of a cow can be determined, but also the length of time a cow will continue to give milk, thus instructing how to avoid purchasing such cows as when pregnant begin to fail rapidly in their milk, and go dry too early to be profitable. After many years of experiment and testing, based upon the form and size of

the escutcheon, Guenon reduced the result of his practice and experiments into a system, and finally published a work upon the subject, which met with much favor, receiving premiums in the form of gold medals and other rewards from agricultural societies, and by the government with a pension for life of three thousand francs.

This work was translated in this country, and had an extensive sale. After several years of practice with it, he rearranged the system, enlarging the number of classes and decreasing the number of orders, thus making it more simple and easily understood, also adding important information respecting bulls, thus revising his former work. Guenon's system included not only the size and form of the milk mirror or escutcheon, but the character of the hair growing upon it, the color of the skin under it, and also the quality of the skin. Thus, to be first-class, the escutcheon must not only be of proper size and form, but the hair upon it must be short, soft, and furry, and the skin under it soft, like a fine kid glove, oleaginous to the touch from the presence of fine dandruff, while the nearer the color approaches to a copper or nankeen hue the better, the hue of the skin denoting the *quality* of the yield. Guenon therefore claimed for his system that it determined the quantity of milk which a cow would yield; the period which she would continue in milk, and the quality of her milk; these rules being alike applicable to calves and bulls, for by them may be determined whether it will pay to raise a calf, or to dispose of it to the butcher, and whether a bull would be likely to transmit good milking qualities to his progeny. Guenon's system, as simplified, is still a complicated one, and while it is of immense value to agriculture, is thought by some to be an attempt to prove too much.

However this may be, it arranges the escutcheon into ten classes, and each of these classes into six orders, which makes sixty divisions or different shapes of which to acquire a knowledge. Besides these there are also ten exceptions or faulty escutcheons that he calls "bastard" escutcheons, which, although bearing so close a resemblance to the others that the practiced eye may be easily deceived, yet differ from them in their yield. Of these Guenon says:

"I have adopted the word 'bastard' to denote those cows which give milk only so long as they have not been got with calf anew, and which, upon this happening, go dry all of a sudden, or in the course of a few days. Cows of this kind are found in each of the classes, and in every order of the class. Some of them are great milkers, but so soon as they have got with calf their milk is gone. Others present the most promising appearance, but their yield is very insignificant."

The system may be greatly simplified by paying little or no attention to any cows bearing escutcheons below the third order of any of the classes, as it would not be a paying investment to purchase or raise a cow with an escutcheon of a low order, it being the opinion of good judges in the practice of this system, that when a cow does not bear an escutcheon of the third order of any class, she is not a profitable milk-producer.

Previous to Guenon's discovery, the milk points recognized in France, Germany, Belgium, Switzerland, and England, were as follows, although in no one of the above-mentioned countries were all of these marks known and recognized:

Favorable Milk Marks.—A broad, large mouth; yellow, short, thin horns; delicate, soft, short, and close hair; broad, well-spread ribs; broad chest; thin, long tail; straight hind legs; regularly arched udder, covered with a short, close, silky down; four teats of equal length and thickness; thick, projecting lacteal veins, which run along under the belly from the udder towards the fore-legs, forming a fork at the end, and finally losing themselves in a round cavity; the milk-wart in the middle of the lower jaw, at the broadest part, nearer to the mouth than the throat.

Unfavorable Milk Marks, before Guenon's discovery, were recognized as follows: long thick horns; long, narrow, pointed head; bull-like, puffy neck; indented, pointed spine;

short, narrow ribs, not much bent; short, thick tail; thin, long, bristly hair; unequally vaulted udder, with a few long hairs; teats of unequal length and thickness; hind legs like those of a goat, bent in the form of a sickle; thin lacteal veins, almost imperceptible without a fork, terminating in a point and without any, or with a very small and shallow indention at the end; when the milk-wart is nearer the throat than the lower lip.

It will be noticed that among these favorable and unfavorable signs, there is no one of them that is in itself reliable, but several of them must be combined; neither do they indicate the yield of milk, the duration of the yield, or give any hint with regard to selecting male animals that will perpetuate the desirable qualities of a breed. If the Guenon system can be relied upon to the extent, or even to a moderate extent, of what its advocates claim, it has certainly proved of great utility in the selection of animals for the various purposes of dairy use.

It seems to us that the classifications adopted by Pabst, Magne, and others, appear to be far more simple and satisfactory than the more complicated classification of Guenon. Without pretending to judge with accuracy of the quantity, the quality, or the duration which a particular size or form of the mirror will indicate, they give to Guenon the full credit of his important discovery, a new and valuable element in forming our judgment of the milking qualities of a cow, and simply assert with respect to the duration of the flow of milk, that the mirror that indicates the greatest quantity will also indicate the longest duration.

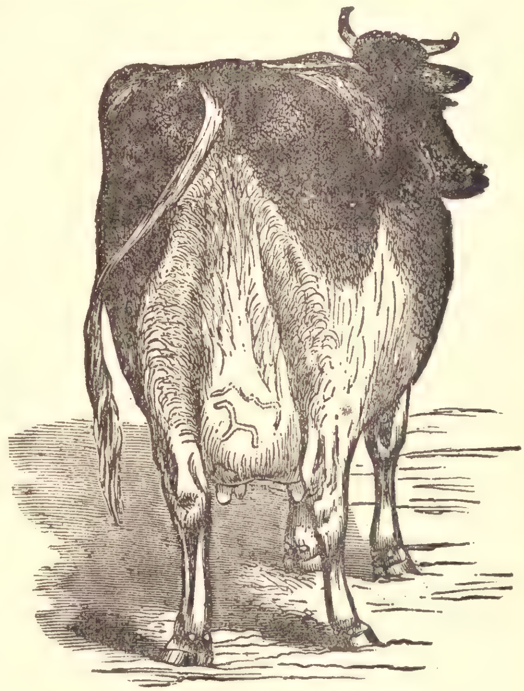
The attention of the editor of this work was called to Guenon's method of judging cows several years ago, and since that time we have examined many hundreds, with a view to ascertain the correctness of its main features, inquiring, at the same time, after the views and opinions of the best breeders and judges of stock with regard to their experience and judgment of its merits; and the result of my observations has been that cows with the most perfectly developed milk-mirrors or escutcheons are, with rare exceptions, the best milkers of their breed, and that cows with small and slightly-developed mirrors are, in the majority of cases, bad milkers.

We say the best milkers of *their breed*, for we do not believe that precisely the same sized and formed milk-mirrors on a Hereford, or a Devon, or an Ayrshire, will indicate anything like the same or equal milking properties. It will not do, in our opinion, to disregard the general and well-known characteristics of the breed, and rely wholly on the milk-mirror. But we think it may be safely said that, as a general rule, the best marked Hereford will turn out to be the best milker among the Herefords, all of which are poor milkers; the best marked Devon, the best among the Devons; and the best marked Ayrshire, the best among the Ayrshires; that is, it will not do to compare two animals of entirely distinct breeds by the milk-mirrors alone, without regard to the fixed habits and education, so to speak, of the breed or family to which they belong.

It is true that there are breeds, such as the Short-Horns, for instance, that are inferior milkers, when compared with some others; and yet we often find on them very fine escutcheons, and this fact may at first seem to conflict with the Guenon system; but it must be remembered that the Short-Horns were originally a good milk breed, and that having been made particularly a beef breed for a long time, the milking propensity has, in most families, been to a great extent bred out, and hence, notwithstanding this change, they may retain the escutcheon more as a characteristic mark of the original breed than as a mark of milking quality. Without regarding the escutcheon as an infallible sign of the quantity and quality of milk, we believe it to be one of the best indications of the milking quality that nature has given; but, as has been previously implied, in the use of the Guenon system there must be taken into consideration the breed, the age, the feed, the treatment past and present, the health, etc.

The Escutcheon.—The escutcheon is that surface of the udder, perineum, and the thighs, where the hair grows upward or contrary to that on the remaining portion of the body. Escutcheons may extend, according to their class, from the center of the four teats to the level of the upper extremity of the vulva, or fall considerably short of it, sometimes reaching in those of a lower class not half that distance; in any case, the broader it extends upon the thighs, and the lower down and higher up the broad portion covers, and the higher up and the broader the vertical portions are, and the more uniform the shape, the more perfect the escutcheon.

Escutcheons are classified according to their form or configuration, and characterize and distinguish the ten classes which constitute Guenon's system, each class being estimated by the limits of the escutcheon. The extreme limits are the hams, the interior surface of the legs, and the vulva, variations from these limits determining the different grades. The lower half or broadest portion of the escutcheon is of nearly similar shape in all the classes, the principal difference being that in the lower classes it is not so broad or so high up, while the vertical portions gradually diminish in height and width until, in the tenth class, there are none.



ESCUTCHEON OR MILK-MIRROR.

The lower part of the escutcheon, or that running out on the thighs, is sometimes called the thigh escutcheon, while the upper part which extends up to or towards the vulva is called the vertical portion. The thigh escutcheon in all classes resembles in outline a round-pointed shovel, while the vertical portion resembles somewhat the handle. The vertical or upper portions are what distinguish mostly one escutcheon from another, and it is in this part that the blemishes usually appear.

According to the Guenon system, the thigh escutcheon indicates the *quantity* of milk the cow will give; the upper portion, or vertical escutcheon, the time she will continue in milk; and the color of the skin, the feel of it, and the character of the hair on the escutcheon, the *quality* of milk.

In connection with these three points, there are two other considerations, and these are the size and breed of the animal. Guenon graded his estimates for three sizes of cows, the high, the medium, the low. It would be absurd to judge of the large-sized breeds with those of the small, such as the Jersey, for instance, on these points, although both might have escutcheons of the first order.

A good escutcheon may be described as follows: A large mirror, having the same form on both sides; continuation of the mirror and of the same color and quality of hair under the tail, the further the better; yellowish hair in the mirror, from which, on rubbing, a yellowish dust or dandruff appears; close, fine, soft, silky hair in the mirror on the udder, and in the secondary marks.

A poor escutcheon, or bad signs in a milker, are: A small and irregular mirror; coarse, bristly, thin hair in the mirror, on the udder, and in the secondary marks; large secondary signs. As a general rule, the coarser and longer the hair the poorer the milk.

Prof. Arnold, a high authority on dairy matters, says: "The size of the escutcheon is regarded as the measure of the quantity of blood supplied to the milk-producing vessels, and is evidence of their capability of elaborating milk. In the same way, the veins take up the blood and carry it back in the milk-veins, which pass through the bag and along the belly, and enter the body through one or more holes on their way to the heart. The size of the milk-veins and the holes where they enter the body vary with the escutcheon, and, like it, give evidence of the quantity of venous blood passing away from and through the udder, and they have the same significance with reference to quantity as the supply of arterial blood and the size of the escutcheon."

But none of these indications, taken singly, is an infallible evidence of large yield. They must be considered together. A large escutcheon and milk-veins, coupled with a small stomach, would be marked down at least one-half of what they might otherwise signify; and a large digestive apparatus, coupled with small milk-veins and escutcheon, should be marked down in the same way. Keeping the leading indications in view, observation will soon enable one to make close estimates."

The Escutcheon on Bulls. — Bulls have also escutcheons similar to those of cows, and it is highly important that the escutcheon of the bull should be first-class. He should also have fine hair and a soft, yellow skin, for such an animal will transmit these qualities to his progeny; and the larger and better the escutcheon of the bull is, the better marked cows in this respect he will get.

Only bulls having these three points well developed should be used for breeding, as they will stamp in like manner their descendants, and as they get so many animals yearly, while a cow gets only one, it is all the more important that the bull should be first-class, although first-class cows should be used as far as possible. Mr. Willis P. Hazzard, a well-known authority on this subject, says that he has gone through herds and picked out every animal gotten by one and the same sire, solely by these marks.

The Ovals. — There is also another mark which accompanies a good escutcheon, and that is one or two ovals just above the hind teats on the udder, on which fine, soft hair grows downward. The hair on them is usually a little whiter and more shiny in appearance than that on the remainder of the udder. These ovals may be large or small, alike or unlike in size, and are always a good sign. The larger and more uniform they are, and the finer and softer the hair is on them, the better.

There is still another good mark that may be noticed in connection with the escutcheon; this is an oval on either side, where the vertical loses itself in the thigh escutcheon. These are called *thigh ovals.* The hair here makes a semicircular dip into the broad part of the escutcheon. If the hair here is fine and short, it is considered by good judges an excellent sign.

Magne's System of Selecting Cows. — As beginners in farming, or even those of long practice, often pay dearly for experience, and as all may be profited by an enumeration of points for the selection of good milch cows, we give a few valuable hints from a work by Prof. J. H. Magne, as follows:

"Where the digestive organs are defective, good milch cows are rarely met with, since these organs have a powerful influence on the exercise of all the functions, and particularly on the secretion of the milky glands. A good state of the digestive organs is evinced by a belly of moderate size, with yielding sides; a large mouth; thick and strong lips; a good appetite; easy and quick digestion; glossy hair; supple skin, with a kind of unctuous feel. The constitution should be sound, and this is implied by large lungs; a broad and prominent chest; a somewhat slow respiration; and a great inclination to drink — an inclination stimulated by the abundant secretion of milk. Preference should be gievn to cows with

small bones, fine and slender limbs, and tail fine at its base; the head small but longish, narrowing toward the horns; the horns themselves of a bright color, tapering finely and glistening; small neck and shoulders, apparently long because slender, especially near the head; small eyelids well divided, but not much wrinkled; prominent eye, and a gentle, feminine look.

Good milkers allow themselves to be easily milked — often while ruminating they look with pleased eye (easily recognized) at the person who milks them; they like to be caressed, and caress in return. The udder is formed principally by the glands which secrete the milk, and called the milky glands. These, four in number, two on each side, are designated by the name of 'quarters,' each constituting nearly a fourth part of the udder. The udder is composed, moreover, of skin, cellular tissue, fat, lymphatic ganglions, vessels, etc. In almost all cows the abundance of the milk is in proportion to the size of the mamelles. The marks indicating that these glands are constituted so as to produce much milk are: a very large development of the hind quarters; a wide and strong lumbar region; a long rump; haunches and hind legs wide apart; a large space for lodging the udder; milky glands well developed, and causing the udder to be of considerable size. In good cows the gland constitutes a large part of the udder, and accordingly after milking it shrinks much and becomes soft, flabby, and very wrinkled. The teats should be set apart from each other, as indicating that the milk vessels are spacious. Of all the marks for ascertaining good cows, the best are afforded by the blood vessels; if the veins which surround the udder are large, winding, and varicose, they show that the glands receive much blood, and consequently that their functions are active and that milk is abundant. The veins on the lateral parts of the belly are easily observed. These veins issue from the udder in front, and at the outer angle, where they form, in good cows, a considerable varicose swelling. They proceed toward the front part of the body, forming angles more or less distinct, often divide toward their anterior extremity, and sink into the body by several openings."

Effect of Food on Milk. — The kind of food given milch cows has a decided influence on the quality and quantity of milk they produce. A half-starved cow will yield but little milk, and the milk will be of inferior quality, while a well-fed cow will give an abundant supply of nutritious milk. A liberal amount of food rich in nitrogenous and phosphatic elements of nutrition, will at once influence both the quantity and quality of the milk. Dr. Voelcker, Chemist to the Royal Agricultural Society of England, says that the finest flavored milk and butter are produced by cows which in summer are fed entirely on grass and rich permanent pastures, and in winter on hay made of fine, sweet grass. He also says:

"Milk may be regarded as a material for the manufacture of butter and cheese, and according to the purpose for which the milk is intended to be employed, whether for the manufacture of butter, or the production of cheese, the cows should be differently fed.

Butter contains carbon, hydrogen or oxygen, and no nitrogen. Cheese on the contrary, is rich in nitrogen. Food which contains much fatty matter, or substances which in the animal system are readily converted into fat, will tend to increase the proportion of cream in milk. On the other hand the proportion of casein or cheesy matter in milk is increased by the use of highly nitrogenized food. Those therefore who desire much cream, or who produce food for the manufacture of butter, select food likely to increase the proportion of butter in the milk. On the contrary, when the principal object is the production of milk rich in curd — that is, when cheese is the object of the farmer, clover, peas, and bean meal, and other plants which abound in Legumin — a nitrogenized organic compound, almost identical in properties of composition with casein, or the substance which forms the curd of milk — will be selected."

Turnips make the milk watery, besides imparting a turnip flavor. Mangolds, when fed with three or four pounds of meal, are good. As an auxiliary to the winter food of milch cows

four pounds of bran meal made into a thin mash, with the addition of three or four pounds of bean meal, makes an excellent ration. If to the foregoing we add twenty-five pounds of mangolds and a due portion of hay or straw chaff, we will supply a food mixture which will produce much and excellent milk. Brewers' grains are often a staple food in town dairies; and even in their wet condition as obtained from the breweries, contain a fair proportion of ready-made fat and flesh-forming matter. They should, however, be fed only in moderate quantities, and in connection with other articles of food. Still slops, or the swill of distilleries, and garbage are too frequently used as the food of cows in milk dairies in the vicinity of large cities, the effect of which is not only to soon cause disease and an enfeebled constitution of the animal fed upon it, but the milk thus produced is entirely unfit for any edible purpose whatever. Revolting as the very term "swill milk" is to every intelligent and thoughtful person, it requires but a slight investigation to disclose the fact that there are millions of gallons of this diseased and poisoned fluid, — miscalled "milk," — produced in the neighborhood of our large cities, the use of which causes such fearful mortality among the children of New York and other cities. Says a recent writer, referring to this subject:

"Every such milk dairy is a common nuisance; and as such it should be suppressed, and the owners and keepers of them summarily punished, both by fine and imprisonment. And if a 'Humane Society,' or a 'Society for the Prevention of Cruelty to Animals,' exist in the vicinity where these nuisances are kept, the first should compel the health authorities of the municipalities to prohibit the sale of their milk, and thus cease poisoning children, and the other should rescue the poor suffering cows from further torture, and a lingering death. It would be so in a country where law is enforced — for we already have *law* enough to abate these nuisances — but we fear nothing less than a knowledge of the imposition, and a determination on the part of those concerned to refrain from the use of the article, will help the matter. On persons concerned in such establishments, our words, if they ever see them, will make no impression, and we therefore address ourselves to those who pursue an honest and honorable business in their own legitimate dairies."

The trade in watered milk, as well as that which is adulterated by mixing with skim milk, though bad enough and quite too common, is far less injurious in its consequences than the traffic in the poisoned product of animals fed on swill and garbage. Roots are excellent to form a part of the rations of milch cows in the winter and spring, especially the latter. Dairy stock that have a liberal daily allowance of roots in connection with other food, almost invariably enter upon grass in a vigorous, healthy condition, and are thus prepared to yield largely in milk through the season. Cotton seed meal is also excellent for milch cows, when fed in proper quantities and in connection with other articles of food. A practical dairyman of large experience states that by feeding cotton seed meal daily to each cow in addition to pasture, the milk yield will be largely increased, and that if he is out of this article of food for only one day, his cows will shrink a quart each in milk; neither will the same amount of corn meal or wheat shorts given in place, keep them up to their full quantity; but after feeding cotton seed meal again for one or two days, they will come up again to their full rate. This may seem a strong statement, but it comes from a careful observer, and a reliable gentleman.

Analyses conducted at the Experiment Station in Connecticut, show that the average estimated value of cotton seed meal exceeds the cost by twenty-four per cent.; hence the use of it for feeding purposes is in the line of economy. A leading authority says:

"As a rule, a combination of wheat bran and oil-cake meal will accomplish more in maintaining a lot of closely-stabled breeding and growing cattle stock in a satisfactory condition, than any other two articles whatever. Bran, which was formerly supposed to be the mere refuse part, bearing a relation to the inner portion of the grain like that borne by the shell of the nut to the meat within, of about as much value as the straw upon which the grain

grew, is found to contain no small portion of the constituents required by both growing and mature animals. The laxative tendency, objected to by some, depends upon mechanical action, and is readily modified by combining the finer descriptions of mill refuse with it, in proportions required by the habits of body of different animals in the herd.

Oil-cake meal, while having a laxative tendency if fed somewhat liberally, nevertheless is one of the best combinations with bran, when skillfully handled, as its mucilage and oil allays irritation of the mucous surface, and the constituents of these two articles, combined with good hay, take, perhaps, a wider range than any other two articles. Oats, of course, are always suitable for either young or aged stock; but in considering the claims which bran has upon our attention, economy cuts quite a figure. This, together with the fact that it is infinitely safer for breeding animals than corn meal, renders it one of the best aids in the feeding stable; provided, always, that it is seconded by other foods, according to the varying requirements mentioned as these occur from day to day. All farmers who occupy advanced ground — all breeders of improved stock are supposed to occupy this position — will bear in mind the manure pile. Bran is rich in phosphates, and these are of special value, to lands long in use, for crop-growing and grazing. There is no mistaking the effect upon pastures of manuring from a pile into which bran has entered through liberal feeding."

Ensilage has been fairly tested as an article of diet for dairy stock, and found to be excellent for this purpose, as will be seen by reference to the opinions and experiments from various authentic sources on that subject, in another department of this work.

In order to make the highest success in the dairy, good milkers should be selected for the purpose, the selection being made by the use of all the known tests of good milking stock. It is also quite as essential that the animals be healthy and of strong constitution. Having such animals for a basis of success, good care, including a variety of food in sufficient quantities, is absolutely necessary to obtain the highest results, and such a course will prove the most profitable and economic in the end. Cattle like a change of food as well as the human species, and it is quite as necessary for their health. It is highly important that the dairyman should study the qualities of different kinds of food and use good judgment in combining them. There are only comparatively a very few kinds of food that contain all the requisite elements in the right proportion, and if different foods are to be given, they should be so combined as to contain as far as possible the required elements in the proper proportion, which can be easily done by giving a little attention to the analysis of different articles of food.

A necessity for a sufficient quantity of food has already been shown, and does not require further notice in this connection. It should however be remembered that a milch cow requires not only enough food to repair the constant drain of the physical system, but also to furnish a sufficient material for the constant drain of milk production. The milk yield, whatever the breed, will be largely influenced by the kind and amount of food given.

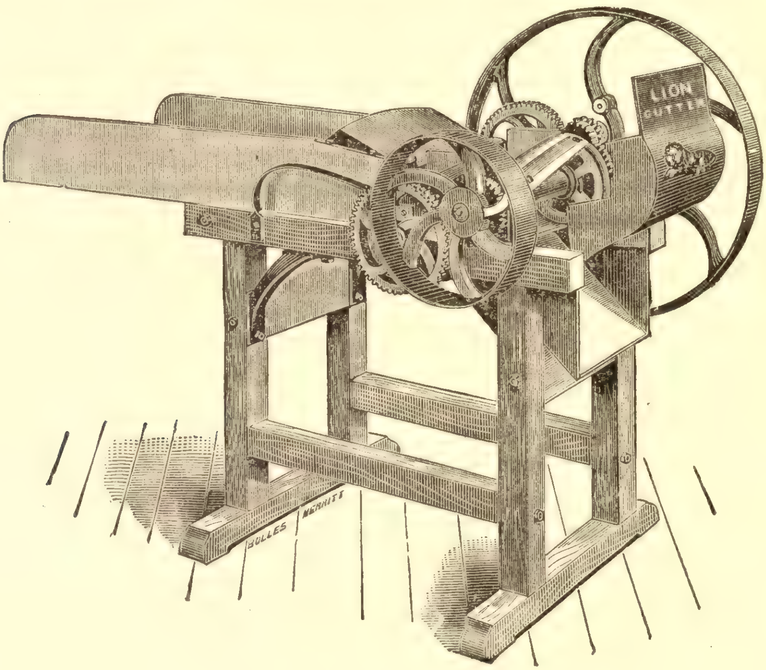
Steaming Food for Cattle.—There has been much discussion with regard to the comparative nutritive value of cooked and uncooked food for cattle, some claiming that the increased nutritive value resulting from cooking amply repays for the labor attending it; others holding to the opinion that the benefits derived do not compensate for the labor required. The cooking of food in sufficient quantities for cattle requires considerable labor, but where the farmer possesses the means of doing this readily, it may be accomplished with the expenditure of much less time and labor than would generally be supposed, and we are of the opinion that, under such circumstances, it is time and labor well invested.

Raspail says that starch is not actually nutritive to man until it has been boiled or cooked; the heat of the stomach not being sufficient to burst all the grains of the feculent mass which is subjected to the rapid action of this organ. The stomachs of graminivorous animals and birds seem to possess, in this respect, a particular power, for they use feculent

substances in a raw state. Nevertheless, recent experiments prove the advantage that results from boiling the potatoes and grain, and partially altered farina, which are given to them for food; for a large proportion, when given whole, in the raw state, passes through the intestine perfectly unaffected, as when swallowed.

Pereira expresses the following opinion: "To render starchy substances digestible, they require to be cooked, in order to break or crack the grains; for of the different lamina of which each grain consists, the outer ones are the most cohesive, and present the greatest resistance to the digestive power of the stomach, while the internal ones are least so."

It cannot be denied that heat, or the cooking power, aids largely in reducing roots, grains, and coarse fodder, such as hay, straw, etc., to a condition that renders them more easily digested, and their nutritive properties taken up by the system more readily and effect-



THE LION FEED CUTTER.

ually; besides, if food is taken into the stomach warm, there is no loss of heat in the animal economy in warming the mass. Many of the coarser articles of food can also be utilized that would otherwise not be eaten by cattle, as by this means they may be mixed with other food, and the whole be rendered palatable as well as digestible.

Mr. E. W. Stewart, who has had much experience in feeding steamed food, describes his process of steaming, etc., as follows:

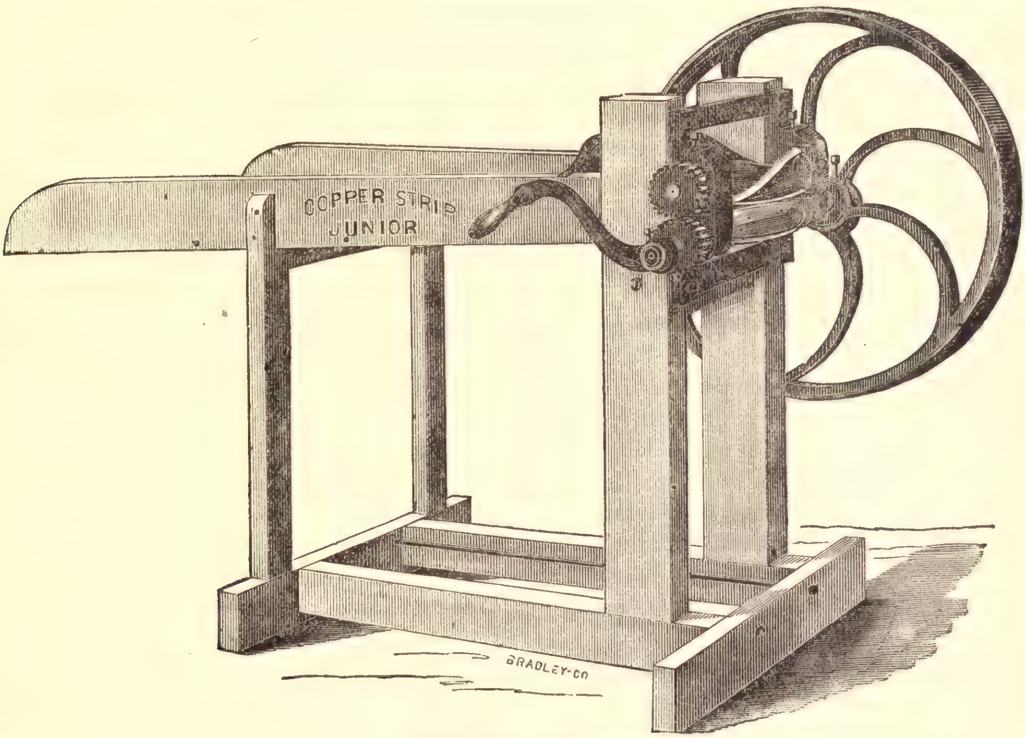
Preparing Food for Steaming.—"The feed is prepared for steaming thus: "The cut straw, hay and straw, roots, or other cut feed, sufficient to fill the steam box, is measured in a square six-bushel basket. It is then moistened by a four-gallon watering pot, with twenty gallons of water to fifty bushels of feed, while it is being stirred up with a fork. Then two quarts of wheat bran to the bushel of straw is mixed in the same manner, and a little salt added, when it is put into the steam box and steamed for an hour and a half. This feed will keep warm for two days in the coldest weather.

The reader will readily see the defect in this arrangement, as, with such a steam box, no considerable pressure can be obtained; hence it does not reduce the feed to such a pulp as is desirable. Yet it modifies and softens it very much. My boiler would safely bear a pressure of thirty pounds to the inch, and, with an iron steam box, the feed could as cheaply be put under that pressure, and reduced to such a pulp as is desirable, as it now is steamed in a wooden box.

For the benefit of those who wish to feed a large stock—one to two hundred head of cattle or more—we would suggest an arrangement which will save much labor, economize the material, and produce more uniform results.

A portable steam engine of five horse-power provided, we will arrange the animals, steam box, food, etc., as follows:

The stables are in the lower story, on each side of a feeding floor ten feet wide. It would be more convenient to have room behind each tier of animals, to pass a cart, or wagon,



GALE'S JUNIOR CUTTER.

to carry off the manure, than to throw it out at the side. A wooden track should be laid in the center of the feeding floor, on which to run the steam boxes. Two holding one hundred bushels each should be provided for one hundred cattle. One would be run under the upper floor to be filled and steamed, and then moved away for use; while the other could be run to the spot, filled and steamed On the upper floor, the straw cutter would be placed, provided with a feeding apron to feed itself, with two bins overhead, one for cut hay or straw, the other for meal and bran. Elevators, to carry up the cut feed from the straw cutter to the feed bin, as fast as cut, would be necessary.

There would also be necessary a water pipe connected with a pump or an elevated reservoir, to furnish water to moisten the feed. A tank might be placed overhead and filled by a force pump. Then, in a scuttle through the floor, directly over the steam box, there will be

placed a cask or cylinder, three feet in diameter and five feet long, without a bottom, but a bar across the lower end, on which an upright revolving shaft will be set in the center, provided with six arms, just long enough to turn inside. This shaft will pass through a like cross-bar on the top, and extending above enough to receive a pulley of the proper size, to revolve it some six hundred times per minute. Now, a spout will extend from the elevated feed bin to the top of this cylinder, with a slide to open or shut it; also a spout extending from the meal or bran bin, so as to communicate in the same way with the cylinder, and a water-pipe, also, furnished with stop-cock and movable cover, will be placed on top of the cylinder. A belt will run from the engine to the pulley on top of this shaft. Now, when ready to fill the steam box, this shaft will be set in motion—the spout for cut feed will be opened so as to discharge a definite quantity, the spout for meal opened to discharge the proportion desired, and the water, so as to let in twenty gallons for fifty bushels of feed. It will be seen that the feed, and meal, and water, in passing through the cylinder, will come in contact with these swift moving arms on the shaft, and be thoroughly mixed, and fall into the steam box, ready for steaming. The feed should be pressed into the steam box, as more will be steamed, and better. With this arrangement, one expert man may cut and steam feed for one hundred head of cattle, and two men could easily care for two hundred. It will be seen that, with proper system and machinery, the expense of cutting and steaming for a large stock will be little more than in the ordinary way of feeding. This steam engine may be used to grind the grain, cut and steam the feed, and do all the work requiring stationary power on the farm. The engine should be placed as near the steam box and straw cutter as it can be with safety. A double spark extinguisher must be placed over the chimney to prevent fire."

Results of Cooking Food.—The same authority summarizes the results of cooking food as follows :

"1. It renders mouldy hay, straw, and cornstalks perfectly sweet and palatable. Animals seem to relish straw taken from a stack, which has been wet and badly damaged for ordinary use; and even in any condition, except 'dry rot,' steaming will restore its sweetness. When keeping a large stock, we have often purchased stacks of straw which would have been worthless for feeding, in the ordinary way, and have been able to detect no difference, after steaming, in the smell, or the relish with which it was eaten.

2. It diffuses the odor of the bran, corn meal, oil meal, carrots, or whatever is mixed with the food, through the whole mass; and thus it may be cheaply flavored to suit the animal.

3. It softens the tough fibre of the dry cornstalk, rye, straw, and other hard material, rendering it almost like green, succulent food, and easily masticated and digested by the animal.

4. It renders beans and peas agreeable food to horses, as well as other animals, and thus enables the feeder to combine more nitrogenous food in the diet of his animals.

5. It enables the feeder to turn everything raised into food for his stock, without lessening the value of his manure; indeed the manure made from steamed food decomposes more readily, and is therefore more valuable than when used in a fresh state. Manure made from steamed food is always ready for use, and is regarded by those who have used it as much more valuable for the same bulk than that made from uncooked food.

6. We have found it to cure incipient heaves in horses, and horses having a cough for several months at pasture have been cured in two weeks on steamed feed. It has a remarkable effect upon horses with a sudden cold, and in constipation. Horses fed upon it seem much less liable to disease; in fact in this respect it seems to have all the good qualities of grass, the natural food of animals.

7. It produces a marked difference in the appearance of the animal, at once causing the coat to become smooth and of a bright color, regulates the digestion, makes the animal more contented and satisfied, enables fattening stock to eat their food with less labor (and consequently requires less to keep up the animal heat), gives working animals time to eat all that is necessary for them in the intervals of labor; and this is of much importance, especially with horses. It also enables the feeder to fatten animals in one-third less time.

8. It saves at least one-third of the food. We have found two bushels of cut and cooked hay to satisfy cows as well as three bushels of uncooked hay; and the manure, in the case of the uncooked hay, contained much more fibrous matter, unutilized by the animal. This is more particularly the case with horses.

These have been the general results of our practice, and, we presume, do not materially differ from that of others who have given cooked food a fair trial."

George Geddes, in his writings on agricultural topics to the farmers of the country, says: "I find if I take ten bushels of meal, and wet it in cold water, and feed twenty-five hogs with it, that they eat it well; but if I take the same and cook it, it will take the same number of hogs twice as long to eat it up, and I think they fatten quite as fast in the same length of time. By cooking you double the bulk."

S. H. Clay, of Kentucky, who has experimented carefully with both cooked and uncooked food, says:

"I fed two hogs on uncooked corn in thirty days, 405 pounds, and they gained 42 pounds; while two hogs fed on cooked corn meal for thirty days ate 270 pounds, and gained 80 pounds. The food was then reversed, and the two hogs that had previously had dry corn were fed on cooked meal. In twenty-six days the two hogs that were fed on dry food ate 364 pounds of shelled corn, and gained 44 pounds; while the two hogs fed on cooked meal ate, during the same time, only 234 pounds, and gained 74 pounds. Here it appears that a bushel of raw corn makes $5\frac{3}{4}$ pounds of pork, while a bushel of cooked meal makes $17\frac{1}{2}$ pounds."

Those who have made a fair trial of steaming coarse fodder have generally recommended the practice as being quite satisfactory in results, since by this means such fodder is rendered more nutritious, and much that would otherwise be wasted can be utilized. There can be no doubt but that grain, potatoes, etc., are much more nutritious cooked than eaten in a raw state, and the question for the farmer to determine for himself is whether the benefits derived from the use of cooked feed fully compensate for the additional labor attending the cooking process. Those who have tested it fully generally concur in the opinion that it does, and that the practice of both the cutting and cooking of food for cattle in the winter season lie in the direction of true economy and success.

A Sufficient Supply of Pure Water for Milch Cows.—It has been found that milk of an average good quality contains from eighty-three to eighty-seven per cent. of water. As a general rule, cows that give the largest quantity of milk will require the largest proportionate quantity of water. It is a fact apparent to all dairymen that cows have a largely-increased appetite for water after they commence giving milk, as compared with the demand for liquid when going dry. Dancel, in his communication to the French Academy of Sciences, reports the result of his experiments in inciting cows to drink large quantities of water. He states that by so doing the quantity of milk yielded by them was increased several quarts per day, without materially injuring its quality. He claims, in the same connection, that the quantity of milk obtained is approximately proportional to the amount of water drank by the animal. Cows which, when fed with dry fodder, gave only from nine to twelve quarts of milk per day, at once increased their yield to from twelve to fourteen quarts when their food was moistened by mixing it with from eighteen to twenty-three quarts of water per day. In the same connection, the cows were allowed to drink regularly, as before,

and their thirst was also a little excited by adding to their fodder daily a small quantity of salt. On a chemical examination of the milk thus produced, it was found to be of good quality, and excellent butter was made from it. He also says, with considerable emphasis, that a cow that does not habitually drink as much as twenty-seven quarts of water a day is actually and of necessity a poor milker, such cows yielding only from five and a half to seven quarts a day; but that all the cows he has seen that drank as much as fifty quarts of water each day were excellent milkers, yielding from nineteen to twenty-three quarts of milk daily. Of course the water required by the cow will depend somewhat upon the character of the food eaten, more water being necessary where dry fodder is given than where the food is moistened. Cows going from dry food to that which is green and succulent, always increase their flow of milk at once, while the yield is proportionately diminished in changing from green fodder to dry. There must, of course, be a judicious limit to the amount of water which a cow may drink, and no person of sound judgment could fail to see that by going to extreme measures in this respect the health of the animals would be impaired, as well as the quality of the milk they yield. Milch cows, as well as all other stock, should be allowed all the water they will drink, and if they can have free access to it so much the better; but it is highly essential that the water be *pure*. How can we expect animals to remain in a healthy condition, or the milk they produce to be of a pure and healthy nature, when the water they manufacture it from is that of stagnant pools, or such as is made putrid by other means? Such milk cannot, in the nature of things, be pure. It is poisonous, contains the elements of disease, and is no more fit to be drank by mankind than the water from such sources. Farmers, as a general practice, are too indifferent or careless with respect to this matter. Where there is not an abundance of pure water from springs and streams on the farm that may be utilized, or if these fail in certain seasons, the difficulty can be easily obviated by the use of wind power for raising water from wells, or by other means, directions for which have been given in a previous department of this work, on "Water Supply of the Farm." Health, as well as economy, require that all stock, and particularly dairy stock, should be supplied with an abundance of pure water.

Shade in Pastures.—While we are aware that many graziers and some dairymen hold different opinions regarding the advantages and disadvantages of shade in the pasture, and while we are perfectly aware of the fact that grass grown in the sunshine is sweetest and best, and would therefore not argue in favor of having what might be called a shady pasture, still we confidently believe in having shady spots here and there in all pastures, and urge upon farmers the necessity of providing for such shade in pastures,—where it is not already provided,—at the earliest possible moment. In the extreme mid-day heat of summer, both men and beasts naturally seek a cool retreat. The shade of a leafy tree under such circumstances comforts and refreshes both men and the lower animals, like a draught of cool water; and animals need the one for comfort, and we might say, health, as much as the other.

There is scarcely a more agreeable scene to be found, by a person of rural taste, than that of cattle standing or lying in picturesque groups, "chewing the cud," a picture of comfort and content, under nature's great umbrella,—a majestic tree, or standing knee-deep in some running brook, with trees in foliage on either bank. Cattle under such circumstances will feed in the early morning or in the evening when the herbage is fresh and sweet from the effect of the dew, and we believe will thrive much better, than stock compelled to remain all day in the hot and burning sun, to say nothing of the comfort thereby obtained. On humane considerations alone, aside from benefits to be derived, all animals should be supplied with retreats of shade from the hot sun.

Where pastures are bare of trees, temporary sheds can be provided, until trees that may be set out will have time to grow sufficient to answer the purpose. There are many varieties

of fast-growing trees, that will in a few years be able to cast quite an area of shade. The best pasturage for milch cows is that afforded by good, old grass lands, in enclosures supplied with shade, and where there is a constant supply of pure water. The best grass for dairy produce is that which is so stocked as to keep it always fresh, green, and sweet. This is most easily secured by having small enclosures and frequently changing the cows from one field to another, thus giving each pasture rest and recuperation as needed. Should the season be dry, and the pasture fail, then recourse must be had to soiling. A prudent forethought will provide for such an exigency. What is desired, is a variety of grasses springing up in succession, and that will bear cropping, by which means fresh pasturage can be had from May until late in the autumn.

Kind Treatment of Cows.—The money value of quietness, gentleness, and good temper in milch stock, is well known and appreciated by all practical farmers as a thing of prime importance; however, in buying or breeding stock, they are quite too apt to overlook these characteristics,—qualities which to a certain extent are inherited from the parents, the same as a disposition to fatten, quality of flesh, yield of milk, etc. An experience of many years has taught us that kindness has a winning and gentling influence on all animals. We have seen many heifers literally ruined by harsh and improper treatment. Even harsh tones, to a nervous and naturally timid animal, are almost as abusive as blows and kicks, and no man guilty of either should ever be allowed the care of cows. Gentle treatment should commence early with the young calf, by frequent handling, feeding, and petting them from day to day, and be continued until and after reaching the dairy.

The calf should never know what it is to fear man; and if never treated harshly, frightened or teased, will, almost without exception, be exempt from vicious habits. We like to see milch cows, and, in fact all animals on the farm, so gentle and devoid of fear of man, that their manner clearly indicates that they seem to regard man as their friend and protector, — stock that can be approached at any time in the pasture or stall, without showing fear of being approached or handled. Such animals can not only be taken care of with less labor than otherwise, but are really more valuable as far as the results are concerned. It is not only of great importance that the diary stock should be of the best quality, but that it should have good and kind care as well; even the best dairy breeds may be rendered inferior, or comparatively worthless, by improper feeding, and cruel treatment.

Thoroughbred and Native Cows Compared.—As illustrating the difference between thoroughbred and native cows, and the greater profit arising from using the former in the dairy rather than our native cows, we propose to give some pertinent facts from "Waushakum Farm," Framingham, Mass., owned by E. L. Sturtevant, at present Director of the New York Experiment Station. The following statement is made after six years of methodical management, in which time the milk of each cow was weighed morning and evening, an accurate account being kept meanwhile of all the food consumed, both as to quantity and cost.

For the first three years the herd of cows was composed of the best natives that could be found in New England; a standing offer of $100 for any cow that would milk twenty quarts a day, bringing the choicest animals from the country for miles around. It will be observed therefore that the native cows owned and tested by the Messrs. Sturtevant for the first three years were what would be called a choice herd, though of no particular breed.

The following are some of the results as given by Dr. Sturtevant in a recent lecture:

	Av. No. cows.	Average yield per cow.
"First year, ...	35.7	5,678 pounds, or 2,160 quarts.
Second year, ...	36.3	4,837 pounds, or 2,229 quarts.
Third year, ...	27.4	4,015 pounds, or 1,850 quarts.
Average number cows for three years, . . .	33.1	Av. yield per cow 2,079 quarts.

During this time we fed on the average to each cow, each year, 351 pounds shorts, 90 pounds linseed meal, 150 pounds rice meal, 879⅗ pounds corn meal, at a cost of over thirty dollars per cow. I will say here that cows that will give twenty quarts a day are rare in New England. We hear of them often; each farmer claims his share. But unfortunately, when put to the test of measure, some exceptional circumstance is the excuse of the owner for the cow not fulfilling his promise. Yet, cows that will give twenty quarts for a few days are found, but those which will continue this flow for any length of time are extremely scarce. If any farmer thinks he has such, let him measure her milk for a few days before he speaks of it. The heaviest milker we have had during these three years of natives, gave for one year 3,703 quarts, but the next year she only gave 1,659 quarts. The heaviest milker for the three consecutive years gave 2,963 quarts, 2,952 quarts, and 2,098 quarts—average 2,672 quarts. Never did we obtain forty pounds a day but with one cow during these three years, and she gave forty-two and one-half pounds once, forty-two pounds once, forty-one pounds twice, forty and one-half pounds once, and forty pounds eight times. It will be remembered that forty-two and one-half pounds is but nineteen and one-half quarts. I am not now stating what can or what cannot be produced by any one in *his* herd; I only give the records of our herd.

After having tested a few Ayrshires in our barn, we crossed the ocean in order to examine improved dairy breeds in their own home, and if we found them of sufficient merit, to bring over to our farm the best we could obtain. After viewing carefully the stock among the best farms in Ayrshire, we were thoroughly convinced of the value of this breed for our husbandry; and not only did the best specimens of cows show value, but the high average quality of those we met with on each farm gave a most favorable opinion of their worth. We therefore imported a lot, and these few, with others purchased in this country, comprise the herd whose statistics we give.

	Av. No. cows.	Average yield per cow.
In the fourth year, ...	19.8	5,678 pounds, or 2,616 quarts.
In the fifth "	18.7	4,990 pounds, or 2,300 quarts.
In the sixth "	13.3	6,221 pounds, or 2,866 quarts.

Average number of Ayrshire cows for three years, seventeen and two-thirds; average yield, 2,594 quarts.

During these three years we averaged two and five-tenths bulls and eight young stock per year, for now we had a breeding herd. By bulls I mean animals in service, and by young stock I refer to animals not calves of the present year, and not yet in milk or use. I think it will be fair in estimating the feed to call two bulls and three head of young stock to require the feed of a cow.

During these three years we carried to the barn on an average each year per cow, shorts, 412 pounds; corn meal, 1,038 pounds; linseed meal, 98.2 pounds; cotton seed meal, 107.6 pounds; malt screenings, 85.6 pounds. This represents a value of twenty-seven dollars and fifty cents per cow, at the same valuation as in the former case. . . . . .

The largest yield in any one of these three years from the Ayrshires was 3,961 quarts. The next year the same cow gave 3,288 quarts. The largest average of the same cow for three consecutive years was 3,160 quarts."

"During this time we had among the Ayrshires sixty-seven yields of forty pounds and over, as follows:

Eleven yields of	40 pounds.	Twenty yields of	41 pounds.
Nine yields of	42 pounds.	Nine yields of	43 pounds.
Six yields of	44 pounds.	Three yields of	45 pounds.
Two yields of	46 pounds.	Five yields of	47 pounds.
One yield of	50 pounds.	One yield of	51 pounds.

Again, selecting six cows each year from the number kept during the whole year, and such represent the best milkers, we have —

In first year, twenty-five native cows, the six best, gave . . . . . 2,919 quarts.
In second year, twenty-five native cows, the six best, gave . . . . . 3,047 quarts.
In third year, sixteen native cows, the six best, gave . . . . . . 2,562 quarts.

Average of twenty-two cows to select from; the six best in the average of three years, 2,842 quarts.

In fourth year, thirteen Ayrshire cows, the six best, gave . . . . . 2,169 quarts.
In the fifth year, fourteen Ayrshire cows, the six best, gave . . . . . 2,747 quarts.
In the sixth year, thirteen Ayrshire cows, the six best, gave . . . . . 3,186 quarts.

Average thirteen and three-tenths cows to select from; the six best in the average of three years, 3,034 quarts.

As a matter of fact in obtaining these results we selected from thirty-five different native cows and seventeen different Ayrshire cows.

It will also be instructive to compare the records of the same natives kept during three years with the Ayrshires under similar circumstances.

Of the eight native cows retained through the three years, from a high opinion of their worth, I present the following figures:

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 8.
First year, . . .	6,416	5,524	3,796	5,408	5,735	1,735	5,866	1,780
Second year, . .	4,554	4,601	4,846	4,079	4,192	7,055	4,457	8,037
Third year, . . .	6,431	4,140	3,112	3,790	4,750	5,144	4,577	3,601
Average lbs., . .	5,800	4,755	3,918	4,425	4,892	4,644	4,966	4,439
Average qts., . .	2,673	2,191	1,805	2,039	2,254	2,140	2,288	2,045

Of an average of 2,179 quarts yearly.

Or the ten Ayrshires retained through three years, we have —

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 8.	No. 9.	No. 10.
Fourth year, .	5,912	6,264	7,176	3,086	6,348	6,305	6,578	6,220	8,596	5,740
Fifth year, .	5,429	5,050	5,854	3,639	6,172	5,147	5,730	5,149	7,135	5,067
Sixth year, .	7,293	5,656	5,636	4,213	5,571	6,299	5,675	6,525	4,846	5,532
Average lbs., .	6,214	5,656	6,222	3,646	6,030	5,917	5,994	5,964	6,859	5,446
Average qts., .	2,823	2,606	2,867	1,680	2,779	2,726	2,762	2,748	3,160	2,508

Or an average of 2,666 quarts.

These figures show conclusively that the best cow in the barn one year is not necessarily so the next, and that a farmer can give his average yield for one year, and not necessarily give the milking average, or average profit of the dairy on his farm."

From the above it will be seen that with the same expense in feeding, there is a credit to the Ayrshire of 500 quarts per head, as a common difference between the amount of milk rendered by the pure-bred Ayrshire per year, and the best native cows respectively. With a herd of twenty cows, such a difference as ten thousand quarts of good milk from having an improved breed is quite an item. By comparing the average yield of the best native cows, as above given, with that of other pure-bred dairy stock, as given in connection with the description, etc., of the pure-bred dairy breeds, the difference will be found equally striking.

The foregoing facts and figures, coming from such unquestionable sources, should be conclusive evidence as to the benefits resulting from the use of improved breeds in the dairy. If our dairy farmers would use only thoroughbred bulls of the Jersey, Holstein, Ayrshire, or some other approved milk breed—selecting a bull for such use that has a good "escutcheon," with other attending milk points, they by such use, would soon possess improved herds of grade cows, and by continued use of such thoroughbred bulls, for a few years at a trifling cost, would be the owners of herds nearly as valuable as the pure-breeds.

A Device for a Self-Sucking Cow. — It is not uncommon for cows to form the habit of drawing their own milk — a habit which is difficult to break up — and, unless it can be prevented by some device, will render the animal worthless, as far as milk-production is concerned. There are many simple devices to prevent this practice that the ingenuity of the farmer might suggest. The two following have proved quite effectual for this purpose: An ordinary headstall is put on the cow, with a ring under the chin; a surcingle is then put around the body of the cow, just behind the shoulders, with a ring underneath. Then attach a stout bar of hard wood (not large or heavy) at either end to both rings, so that it will reach from the ring under the chin to the ring in the surcingle, leaving three or four inches of perpendicular length in a strap or light chain between the ring under the chin and the end of the stick to which it is attached. This will not interfere with the animal's feeding or drinking, but will prevent her reaching her nose to her udder. Another device is thus described by a farmer who has found it very useful:

"Cut a piece of tug from an old harness, of sufficient length to go around the cow's nose, about three inches above her mouth. Split the tug out upon one side for about eight inches, and drive wrought nails so that the heads will rest against the inner surface of the other half of the tug. By means of a strap, which passes over the cow's head, this barbed tug will be secured to the bridge of her nose. The moment she attempts to draw her milk the points of the nails will come in contact with her udder, and thus be a complete preventive."

Driving Cows from Pasture. — Cows that are worried by dogs in being driven from the pasture, or whipped, shouted at, and hurried by a thoughtless and brutal driver, are in no condition to yield milk of the best quality or quantity. They should always be driven quietly, and never faster than a walk. With their udders distended with milk, as those of good milkers would necessarily be, it would cause discomfort and pain to be obliged to go faster than a walk; besides, by hurrying cows under such circumstances, especially in warm weather, there will be a liability of their blood and milk becoming overheated, and such milk is not only unfit for use, but it will injure other milk with which it comes in contact.

Let the cows always be driven quietly and at an ordinary walking gait to pasture and from it, if you wish to obtain the best quality of milk, and also keep the cows gentle and quiet; for even with all the other essentials of success in dairying, if this rule be ignored, the best results cannot be attained. First-class dairy products cannot be made from diseased milk. Farmers and dairymen generally are too careless and indifferent in this respect, and permit their cows to be dogged and hurried from the pasture to the milking yard without the least thought of the injury that will inevitably result from such a practice.

Milking, etc. — The following on milking, from Willard's Practical Dairy Husbandry, is so much in accordance with our own views that we quote it verbatim:

"Farmers generally have the impression that when milch cows have wintered well and are fairly out to grass there need be but little care or attention given to animals, and that then in their herds they have a fountain that is to supply good, pure milk simply by drawing it, not much matter *how* or *when.*

It is true, people understand that where cows are milked with great irregularity, or are subjected to any extraordinary brutal treatment — such as sundry kicks in the udder with a heavy boot — they will yield unprofitable results, since the consequence of such management forces itself almost immediately upon the attention. But it is not those things that come so plainly under the eye of the observer, concerning which I propose to speak. If an angry man kicks his cow in the udder, some of the blood-vessels of the part will probably be ruptured, and the bloody milk which flows from the teats will speak more forcibly than any words of mine; but if he kicks her in the ribs, or mauls her with a milking-stool upon the hips and back, the consequences may not be so immediately apparent, yet that damage is

done and that loss will follow is equally certain. I am speaking of no exceptional cases, but of those that are of common occurrence wherever any considerable herd is kept, and where the eye of the master is not sharp to detect and punish these offences. The pressing want in the dairy districts to-day is for good, kind, humane laborers, who can be trusted to do the milking in a proper manner. Many of these people do not understand that any particular loss is to follow from a moderately brutal and cruel treatment of cattle.

I have always advised dairymen to make a special contract with laborers who are to be employed about the dairy. Let it be understood that the moment a cow is maltreated that moment a settlement is to be made, and the party offending to be discharged, with a reasonable deduction from his wages. This, fairly understood at the time of hiring, together with proper oversight of the animals, and those about the dairy, will go far to mitigate a great and growing evil. It is a lamentable fact that there are a large number of ailing milch cows in the dairy districts — cows that are not in vigorous health, that fall off in milk, that have sick turns now and then — which, if the history of their treatment was known, could all be traced to the causes I have enumerated. A rap upon the spine with the stool has ruined many a valuable beast; a stroke upon the udder has often produced unaccountable cases of garget.

I wish it could be generally and thoroughly understood that nothing pays better in the dairy than kindness and gentleness to stock. Milch cows should be kept as quiet and comfortable as possible, and no person should be employed in milking that the animals fear. Any undue nervous excitement not only lessens the quantity, but depreciates the quality of the milk. Sometimes cows take a dislike to their milker, and in such cases a change should be made, otherwise there is a liability of the cow falling off in her milk. I have seen several cases of this kind, and although such freaks are unaccountable it will always be found better to change the milker if possible, rather than to attempt to conquer this peculiarity. I do not approve the practice, common with some dairymen, of the milkers milking the cows indiscriminately. The hands should each select a certain number of cows, and continue to milk them from day to day throughout the season.

The hours of milking should be regular, and each cow should be milked in regular order. The milk should be drawn rapidly and to the last drop, and all loud talking, singing, and wrangling avoided. These are little things in themselves, and may seem to many to be 'over nice;' but repeated and well-conducted experiments have convinced me that they are important points to be attended to, and must be observed to obtain the best results."

The manner of milking exerts a great influence on the yield. A slow and careless milker will soon dry up the best cow. The milk should be rapidly drawn, and the last drop obtained, as that which is left becomes reabsorbed into the system, or becomes hardened in the udder, and diminishes the tendency to secrete a full quantity afterwards. Harshness in pulling and drawing upon the teat in milking should be avoided. Many cases of garget are, without doubt, caused by this practice. In milking, the teat should be clasped and the milk squeezed out by the pressure, or the ends of the fingers may be pressed upon the milk duct in such a manner as to force out the milk, a slightly upward movement or lift being given to the udder previous to the pressure. The nails of the milker should always be cut short, to avoid injury to the teat.

Much has been said and written respecting the milkmaids of Holland, and the benefits resulting from their gentle treatment of the cows under their charge. The *London Grocer* gives an exceedingly picturesque description of them in their attendance upon the large black and spotted cows that are kept in stables scrubbed so clean as to be in contrast with many carelessly-kept kitchens. It is stated that the health of these great, shining cows is guarded with such care that it is not uncommon to see their feet covered with leather shoes when taken to pastures where the soil is damp, to prevent them from contracting a disease of the feet. In winter they are protected from the cold by cotton blankets.

"Milkmaids of the rosiest complexion attend them to the fields, and treat them so gently that their tempers are never ruffled. Holland is a modern Arcadia of pastoral happiness. Perhaps it is to be regretted that we have lost our ruddy race of milkmaids, whose gentle ways made gentle cows, and have substituted the masculine help with his club, or sent the boisterous dog to worry them home. The milkmaid should still be found, even in this free and gallant country, plying the art which she so deftly executes. There is no more impropriety in a woman milking a cow than in feeding chickens; and if women had the training of cows, there would seldom be a vicious one. If we could teach the men who milk our cows to treat them as kindly as the Holland milkmaids do, it would make a great difference, not only in quantity, but in quality of milk. Excitement has a serious effect upon the quality of milk. The milk of a single cow worried by a dog has been known to spoil a curd of cheese from twenty cows."

Study the Disposition of Cows. — It is highly essential that the milker should understand the disposition of the cows under his especial management. Mr. Willard, the authority previously quoted, says:

"I always insist that the milker study the disposition of the cows under his charge; that he become familiar or acquainted with each animal, patting them, or in other ways making them understand that he is friendly and fond of them. When once their confidence has been obtained in this way they will exhibit affection in return, and will yield in the increased quantity of milk more than enough to pay for the time and trouble given to the purpose indicated. Some cows are extremely nervous and excitable; such require caution and attention in management, otherwise they soon become worthless for the dairy.

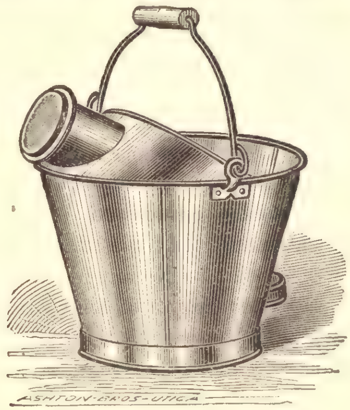
Cleanliness Essential. — Some people are in the habit, when first sitting down to milk, of drawing a little milk to wet their hands and the teats of the cow. It is not a cleanly practice, and should always be avoided. I have seen milkers with their hands gummed up with filth, and the reeking compound of milk, dirt, and manure oozing out from between the fingers and dropping into the pail, as the result of this bad habit referred to. In some dairies a great deal of milk is tainted in this way, and not unfrequently this taint shows itself in a very marked degree in the butter and cheese manufactured. Many thoughtless persons have the impression that milk in some way purifies itself, and that taints imparted in the way I have named cannot be carried into the butter and cheese. Such ideas are very erroneous, and the sooner correct notions are had in regard to the purity and cleanliness of milk for dairy purposes the sooner shall we arrive at a higher standard of excellence in dairy products, and, as a consequence, better prices be obtained.

Cows do not milk any easier with wet hands than with dry hands. If the udder or teats are muddy or covered with filth, they should be washed with clean water and wiped dry. Then milk with dry hands, and it will soon be found easier and pleasanter, even with those who have been accustomed to wetting the hands and teats while milking. In summer, when cows are running upon clean upland pastures, the udder and teats will generally be clean, except perhaps in wet weather. If there is no occasion to wash the udder and teats, it is always well to brush over the parts with the hands or with a cloth, to remove any particles of dust or loose hairs adhering, and then set the pail in position and commence to milk with dry hands. Uncleanliness in milking is one of the great faults in the dairies of this country, and it is one of the causes of bad flavor in dairy products. Every dairyman should fully explain this matter to hired help, and insist upon cleanly habits in milking. That the fault referred to is a serious one and more general than some would at first imagine, can very easily be demonstrated by visiting any of the factories at the time the milk is being delivered. Let the milk strainers then be closely scrutinized, and they will often be found to present a most disgustingly filthy appearance. If this mass of filth could be shown to some uncleanly milkers, I hardly think they would be willing to test milk filtered through such material."

Sore teats are more frequently caused by the uncleanliness of the milker, and leaving the teats wet after the milking, than from any other cause. This makes them chap and crack, rendering the milking process a painful one to the poor animal. For the treatment of sore teats, see CHAPPED TEATS, in the department of diseases of cattle.

Various kinds of milk pails have been invented, all of which possess more or less merit. The Perfect Pail, of which we give an illustration, is one of the best we have seen, since it combines pail, milk stool, and strainer all in one. It cannot be kicked over nor knocked over

THE PERFECT MILK PAIL.



DODGE'S TRIPLE STRAINER.

by the cow. The pail is made of the best tin plate, will bear weight of 300 lbs. or over, holds fourteen quarts; its cover makes a seat for the milker; the funnel which receives the milk is supported by a rubber tube which returns it to its position if moved by kicks or blows from the cow. A strainer is placed in the lower end of the tube. Any impurity falling upon or into the funnel can at once be removed and the funnel or the strainer cleansed if necessary, by a stripping of milk.

The Dodge Strainer consists of a series of three strainers put into the cap resting upon its internal ring, the cap being secured down tight upon the permanent ring, the intersections forming an irregular passage for the milk.

Teat Tubes and Milking Machines.—These are a nuisance on the farm, and should never be tolerated, except perhaps it may be the former in rare instances, when the teats of the cow are so sore, from cowpox or other cause, as to render the drawing of the milk by this means a necessity for a few days. We have never yet seen a milking machine that has been invented that was not without serious objections, and we know that many valuable cows have been ruined for milking purposes by their use. The only milking machine that should be utilized in the cattle yard is a clean, quiet, gentle, intelligent man or woman, who, knowing how to milk, and always milking the same cow or cows, can draw the milk in the best and therefore easiest manner, and in the shortest time.

Milk Houses.—A good, cool, well ventilated milk house is one of the essentials of a well regulated dairy. Such a house may be made of wood, stone, or brick, and if properly constructed, the kind of material is not essential. Some prefer a wood house to stone or brick, as the former will better retain an even temperature. A leading authority on dairying says of such a milk house:

"A frame house must be well constructed, otherwise it will soon begin to decay at the foundation, and this will at once destroy its usefulness. The frame house should be supported upon brick foundations, and if the soil is suitable the foundation should be sunk at least four feet below the surface.

The foundation should be of brick or stone, and carried up sufficiently to preserve the timber from decay; the floor covered with hydraulic cement concrete three inches thick, and finished with a light coat of clear cement and sand in equal parts. The windows should be on the north side, and protected by a wire gauze screen against flies. A space of two feet should be left above the ceiling, and through this a ventilator be passed, which is closed by a trap door that can be raised by means of a cord reaching down below. The walls and ceilings should be plastered, and a hard-finishing coat of plaster of Paris, costing only a few dollars extra, will add much to the cleanliness. Lime wash will be always peeling off and the scales will fall down upon the milk occasionally. The hard finish is less porous than the lime, which is an advantage.

A brick, stone, or concrete milk house will be preferable where the material can be procured easily; stone or concrete will be the cheapest where the stone or gravel is abundant, and either is better than brick both for winter or summer use. If the walls are lined inside by means of furring strips four inches thick, upon which the laths are nailed, a considerable air space will be secured, and this will help greatly to preserve an even temperature in the house. The outside of the milk house should be painted or washed white, as this reflects the heat and keeps the inside much cooler than bare bricks, stone, or boards would.

For a butter dairy a churning-room will be required, and this room should be provided with a sink and water for washing pans and utensils. To secure drainage the floor should be raised at least a foot above the level of the ground, and the surface outside should be graded up to the door-step, which should not be raised more than seven inches. It is very inconvenient to have steps up to a dairy, because in winter these are slippery with snow and ice, and it is a severe tax on any person to carry heavy pails up a number of steps. The sink in the churning room should be provided with a pump from a cistern or well close by; a cistern is the best because it will receive the water from the roof and keep the ground dry about the foundation.

A drain should be provided in the corner of the sink. Above the sink some racks may be made to hold spare milk pans, pails, etc. The milk-room is reached by a few board steps, with a rise of not more than seven inches each. The shelves are ranged around the sides, and a wide, low table is in the middle for the cream jars and to do the skimming upon. If deep setting is practiced, less room will be required. But it will always be well to estimate for the largest possible amount of space and room in a dairy, and then make it still a little larger. In my experience in planning dairies for myself and others, I have never yet found one too large, but many that have soon proved too small."

That well known writer, Mr. Henry Stewart, gives an excellent plan for a milk house which may prove of value to many dairymen contemplating building one—it is as follows:

"If the first requisite of good butter is the cow, the second is the dairy-room or house, for it is useless to produce good milk if it is spoiled in the keeping. A dairy-room should have an even temperature, and in the winter may be kept at about 45 to 50 degrees. One that is partly underground and has an apartment over it for churning and washing pans, etc., is preferable, as it will need no artificial heating by a stove. I prefer one with brick walls, whitewashed with lime, plastered overhead, and with a cement or flag-stone floor; that has the windows above ground and facing the south and west; the windows covered with fine wire gauze outside and hinged at the top, so that they may be opened by raising and hooking up the sash. The window, being close to the ceiling, ventilates the room completely.

My own aim in a dairy house is a building having a brick basement in a hill-side, with ice-house in the rear, having a chute on the bank through which to put in ice; and the milk room in the front, with porch for airing the cans and pails. Over the milk-room shall be the churning and washing room, provided with water heater, and with an elevator for passing cream and butter up and down, and stairs leading below; also a sink with taps from a tank

above. Over the milk-room shall be a tank supplied from a well, by a wind-mill overtopping the whole. From the tank water may flow through a pipe into the rooms below, for use in washing pans or supplying water in case the submerged-can system of settling the milk might be used at any time. A sink and drain may also be carried from the milk-room. The tank will be high enough to supply the house and the barn with water through pipes. The cost of the whole I estimate to be about $600 for a dairy of fifty cows, and no one can doubt that it will be a profitable investment for the maker of extra butter."

Every milk house should be provided with good ventilation, in order to keep the milk sweet and from becoming contaminated with taints and odors. Where milk houses are not provided, the common practice in family dairies is to keep the milk in cellars, as that is the most convenient receptacle for it. When the cellar is used for this purpose, it should be kept absolutely clean and free from dampness and all foul odors. The floor should be made of cement, the walls closely painted and whitewashed, and a sufficient number of windows provided to afford a moderate amount of light. The windows should be covered with fine wire gauze to keep out the flies, and a slatted door, also covered with the same, be provided on the north side. The ceiling overhead should be lathed and plastered to prevent the dust from dropping down from the rooms above.

Ventilation may be secured by means of a tube or spout from the floor to the ceiling and through the wall, thus connecting with the air outside. This should also be protected by a fine wire gauze. This outlet should be divided in the middle, and one-half communicate with the spout which reaches to the bottom of the cellar, through which the fresh, cool air from outside may find an entrance, and the other half be connected with a short upright spout outside, through which the warm, foul air may escape.

These spouts should be provided with slides, so that they may be closed when necessary. By this means a cellar may be kept well ventilated, for the cold air coming in from the outside at the bottom, is dryer than the warm air of the cellar which passes out at the top, so that the moisture from the cellar is constantly being absorbed and carried off as long as the warm air flows out of the upper spout or opening.

Dampness in Milk Cellars.—If a cellar is so damp that the above method of ventilating does not entirely remedy the evil, the air may be dried by keeping a peck of fresh lime in the cellar, placed in a box or tube and exposed to the air. Twenty pounds of lime (or one peck) will absorb about seven pounds of water, and this amount of moisture taken from the air of a cellar will make quite a difference in drying it. The lime thus slacked will fall to a powder, and may be used for other purposes.

The Use of Ice in Dairies. — One of the first requisites of a milk house, or the dairy room, is a cool, even temperature; and this cannot be maintained in warm weather without ice. One of the modern improvements in butter-making, and the one that has been most effectual in raising the quality of butter, is the use of ice. It is indispensable to the highest success in any dairy, large or small, and when once the conditions are understood by which its consumption may be regulated economically, so that needless waste may not occur, its use will prove one of the economies of the dairy, not only in the larger quantity of butter produced from the milk, but in the higher price the improved quality of the butter will command.

Where a proper temperature is not maintained during the warm weather, much cream is wasted by the cream souring before it is all raised; and not only this, but the cream taken from such milk will be of an inferior quality, and will consequently produce an inferior grade of butter. Mr. H. Stewart, previously quoted, says respecting this subject:

"The most economic use of ice is when it is applied directly to the cooling of the milk alone, and is not wasted in cooling the surrounding air or the readily conducting walls of ill-

adapted vessels or receptacles for the milk. Probably the most convenient manner of using it is in a non-conducting refrigerator, closet, or tank. In using these it will be well to remember that when once the water or the air in the tank, or closet, and the substance itself of these, have been cooled to the lowest degree, the greatest economy consists in preserving the low temperature by keeping up a supply of ice. The loss of ice by conduction from a well constructed closed refrigerator is very small; but if this is left open when not in use, a considerable quantity of ice will be required to cool it down again, and this waste is loss. One pound of ice will cool one pound of water of 174 degrees to a temperature of 32 degrees. In other words, one pound of ice in melting absorbs 142 degrees of heat. This is known as the measure of the latent heat of water at 32 degrees, and which must all be given off to the atmosphere before the water can become completely changed to ice. It may be said, then, that water absorbs cold, which is the same thing practically as giving out heat; and this result may often be turned to good account in milk rooms or dairies in cold weather, to prevent the milk from freezing, by putting a tub of warm water into the dairy. The water will freeze before anything else, and in freezing actually warms the air and contents of the dairy, or rather, in reality, takes up all the cold in excess of 32 degrees, until it is frozen.

One pound of ice, therefore, in melting, will absorb sufficient heat to reduce four pounds of milk from 80 to 45 degrees; and if a good refrigerator is used, there will be little loss of ice in overcoming the water from the cooler. The quantity of ice to be provided may therefore be readily calculated, by considering that every pound melted will take 142 degrees of heat from a pound of milk; 71 degrees from two pounds; 47 degrees from three pounds; 36 degrees from four pounds; or 18 degrees from eight pounds. If therefore the milk is first set in cold spring or well water, and reduced down to 80 degrees, one pound of ice will then be able to reduce nearly 10 pounds of it to a still lower and perfectly safe temperature of 45 degrees. At this temperature the cream may all be raised from milk in twelve hours, and milk may be kept sweet for seventy-two hours or longer.

An ice house and a supply of ice will be found indispensable to every well conducted dairy, from a one-cow establishment up. The supply of ice may be procured without difficulty by throwing a low dam across a small stream, and collecting the water in a pond, or by excavating a pond, where there are no other means of getting it. A cubic foot of ice weighs about 55 pounds, or one-ninth less than water. A surface of less than 80 square feet of ice six inches thick will yield a ton, and a pond of a quarter of an acre will therefore give 136 tons with ice of this thickness only. The ice house and dairy should be contiguous and yet separate."

The cream should be obtained from the milk while it is sweet, and in order to secure this object, ice is essential in warm weather, which, with the requisite conveniences for the purpose, such as may be found in some of the improved creamers adapted to the modern system of deep setting, etc., a uniform quality can be secured, and as good butter be made in August as in June, providing the feed be of equal quality.

Taints and Odors in Milk. — One of the reasons why we prefer deep setting to shallow setting of milk, is because less milk surface is exposed to the air by the former method than the latter; for unless the air that comes in contact with the milk is perfectly pure, the milk will be liable to absorb any impurity it contains, and acquire taints that will affect the quality of the butter. There is no article of food so susceptible to odors, and so easily contaminated by surrounding impurities as milk. In fact, it affords one of the most fertile fields for developing and multiplying the seeds of fungus plants, which to a greater or less extent are always found floating in the atmosphere, and if this fact were more generally known, there would be more caution exercised on the part of every dairyman with reference to the quality of the air which is permitted to come in contact with milk.

It should be remembered, also, that milk not only absorbs spores that quickly produce acidity, but it also absorbs from the atmosphere spores of every other kind as well. Nor does this characteristic of milk stop with absorbing living germs, for it takes in every odor as well as the seeds of every ferment, that blows over its surface. It is the same, also, to a great extent, with water, which soon becomes unfit for use if allowed to stand where it may be contaminated by impure air; and if placed in a cellar where it is exposed to air charged with the odors and spores of decaying vegetation, it soon smells and tastes like the foul, fever-breeding air that envelops it.

The *London Milk Journal* cites instances where milk that has stood a short time in the presence of persons sick with typhoid fever, or been handled by parties before fully recovered from the small-pox, spread these diseases as effectually as if the persons themselves had been present. Scarlatina, measles, and other contagious diseases, have been spread in the same way. The peculiar smell of a cellar is indelibly impressed upon all the butter made from the milk standing in it. A few puffs from a pipe or a cigar will scent all the milk in the room, and a smoking lamp will soon do the same. A pail of milk standing ten minutes where it will take the scent of a strong smelling stable, or any other offensive odor, will imbibe a taint that will never leave it. A maker of gilt-edge butter objects to cooling warm milk in the room where his milk stands for the cream to rise, because he says the odor escaping from the new milk, while cooling, is taken in by the other milk, and retained to the injury of his butter. This may seem like descending to little things, but it must be remembered that it is the sum of little things that determines whether the products of the dairy are to be sold at cost or below, or as a high-priced luxury. If milk is to be converted into an article of the latter class, it must be handled and kept in clean and sweet vessels, and must stand in pure, fresh air, such as would be desirable and healthy for people to breathe.

For reasons already given, cellars that are used for milk setting should never have turnips, potatoes, apples, or anything stored in them that will emit the least odor, and the air should be kept as pure and free from dampness as possible.

Effect of Thunder Storms on Milk.—It is a fact known to almost every person having any experience in the care of milk, that thunder storms will frequently cause sweet milk to turn sour in a short time, especially if there seem to be certain atmospheric conditions attending it, such as a superabundance of electricity. In order to prove whether there was any foundation for this opinion so prevalent among dairymen, Mr. M. W. Iles tried the following experiment, the result of which we clip from the *Journal of Chemistry*. He says:

"I took skimmed morning's milk, filled an eudiometer tube (300 c. c.), and introduced 100 c. c. pure oxygen gas; then by the use of an ordinary battery and a small Ruhmkorf coil, sparks of electricity were made to pass through the oxygen for five minutes. The current was then broken, and the tube shaken up and allowed to stand for five minutes. The milk does not appear quite as opaque, and shows a noticeable acid reaction. On continuing the current for five minutes longer—making ten minutes in all—the milk curdles very perceptibly, and shows a decided acid reaction. The contents of the tube, on standing for twenty minutes, has reached the consistency of ordinary sour milk or 'bonny clabber.'"

The cause of the rapid souring of milk in thunder storms is due to the oxygen being converted into ozone, the increased acidity being due to the formation of lactic acid, and doubtless some acetic acid. By means of the ozone these acids cause the casein contained in the milk to be precipitated.

Butter as an Article of Food.—As an article of diet, butter was used at an early period of the world's history, it being made from the milk of sheep and goats. The wandering tribes that were accustomed to take long journeys, doubtless took with them a supply of milk in skins,—of which their bottles were made,—and the agitation of the milk in travel-

ing would probably cause butter to be mixed with the milk. This may be the means that suggested the first rude and simple process of churning, such for instance as that employed by the Arab, who fills his skin bottle with milk, and strapping it on his horse behind him, gallops his fleet courser over the desert plains, until the milk is sufficiently churned by this process to produce butter. The oldest Greek writers speak of milk and cheese, but there is no mention of butter by them. It is supposed that the Greeks obtained their knowledge of butter from the Scythians or the Thracians, and the Romans theirs from the Germans.

In the time of Christ butter was used principally as an ointment in the baths, and as a medicine. In many of the warm latitudes, at the present day, its use is limited, olive oil being employed as a substitute. Butter is the fatty portion of the milk of mammalian animals. It has been made from the milk of sheep, goats, and other animals; but that made from cow's milk is the most delicate and delicious in flavor, and it alone constitutes the butter of commerce. It is found that the milk of various breeds of cattle differs greatly in the proportion of fatty matter it contains, its richness being due to the proportion of butter globules which are found floating in the milk, and which give it its whitish color, and render it opaque. The proportion of butter or fatty globules in the milk varies somewhat with the breed, and is largely influenced also by the season, nature, and quantity of food, state of the animal's health, and other conditions.

The proportion of cream to milk, in most cases, ranges from one-twentieth to one-tenth, although with individuals of some of the celebrated butter breeds, such as the Jerseys or Guernseys, it frequently amounts to from three to four-tenths.

Voelcker briefly gives the composition of butter, and explains how casein injures its flavor. He says: "Butter consists mainly of a mixture of several fats, among which palmitin, a solid crystalizable substance, is the most important. Palmitin, with a little stearin, constitutes about sixty-eight per cent. of pure butter. Mixed with these solid fats are about two per cent. of odoriferous oils. The peculiar flavor and odor of butter are owing to the presence of this small proportion of these peculiar oils, viz., butyrin, caprone, and caprylin. In butter, as it comes upon our table, we find besides these fatty matters about sixteen or eighteen per cent. of water; one to two per cent. of salt, and variable small quantities of fragments of casein shells. The more perfectly the latter are removed by kneading under water, the better butter keeps; for casein, on exposure to the air in a moist state, especially in warm weather, becomes rapidly changed into a ferment, which, acting on the last named volatile fatty matters of butter, resolves them into glycerine butyric acid, $C_8 H_8 O_4$; caproic acid, $C_{12} H_{12} O_4$; and caprylic acid $C_{16} H_{16} O_4$. The occurrence of these volatile uncombined fatty acids in rancid butter, not only spoils flavor, but renders it more or less unwholesome."

If these casein shells could be separated from the butter, it could be preserved for a long time without salt. When butter is melted and the impurities taken out by heat, the same as lard is manufactured, it becomes more like oil, and loses its peculiar aroma and texture. When unadulterated and prepared with ordinary care, butter should contain at least ninety per cent. of pure fat, the remainder consisting of casein, water, and salt. Casein, derived from a remnant of milk not washed out of the butter, may be found, but should not amount to more than from two to four per cent., nor should water be found in quantity more than from three to six per cent.

A small quantity of salt is worked into the butter during its preparation, but this should not exceed in quantity from one-half to two per cent. of the whole weight.

Statistics show that Great Britain consumes considerably more butter than her farmers produce. Next among European nations, Holland is justly celebrated for the quality and quantity of its butter product; but it is stated on good authority that nowhere outside of Paris, until quite recently, could one find those golden "pats" of such delicious flavor and delightful aroma, that have excited such a spirit of emulation among the more enlightened

dairymen of this country, and which has caused them to excel the dairymen of the old world in the production of that delicious article for table use commonly known as "gilt edged butter." The success attained in the manufacture of this grade of butter depends not so much upon any special breed of cows, as upon the care and perfect cleanliness with which all the processes are carried on, from the milking of the cows to the rolling and stamping of it for the market.

Notwithstanding the increased manufacture of this dairy product within a few years past, by the establishing of creameries in various parts of the United States, as well as the greatly augmented interest manifested in private dairies, the demand for the best grades of butter still largely exceeds the supply, as is evidenced by its scarcity in the market and the high price it commands. There is therefore every inducement for the dairymen and farmers of our country to endeavor to supply this rapidly increasing want by furnishing a product of the very best quality.

Methods of Obtaining Cream.—There are various methods of obtaining cream for the manufacture of butter, the most common of which may be classified into two systems, viz.: "Shallow Setting" and "Deep Setting." Besides these common methods of cream raising, there is in practice, to a very limited extent, another method known as the Centrifugal System.

By the first method shallow pans are used for holding the milk; by the second, deep open pans, or deep, closed cans, submerged in ice-water, or kept cool partly by means of water and partly cold air; and by the third, a centrifugal machine, so constructed that by its rapid revolutions the cream is readily separated from the milk in a few moments.

Shallow Setting.—It was formerly thought that more cream could be obtained from a certain quality of milk set in shallow pans than if it were set in deep vessels; and even at the present time this system still has its followers; but the majority of dairymen of the present day prefer the deep-setting. By this system shallow pans are used for setting the milk. This method of setting is quite convenient where there is only a small quantity of milk, and answers the purpose very well, provided the pans can be so arranged that the milk can be either warmed or cooled as necessary, to maintain a uniform temperature of sixty degrees. A cool, well-ventilated dairy-room, easily controlled, will be essential for shallow setting.

The milk is generally set about two inches deep, and the pans partially submerged in cold water, either running water from a cold spring, or a tank for holding a sufficient supply of water for the purpose, which is kept cool by the use of ice.

There are, however, many objections to this old method of cream raising, the principal being that uniformity of quality in butter cannot be secured by it, since it is almost impossible to maintain a uniform temperature of the milk, it being subject, more or less, to the conditions of the weather, state of the atmosphere, etc. When the weather is favorable, the butter made by this system of cream raising will be of good quality, other conditions being desirable; but in very warm, muggy weather the cream will generally be of poor quality. By this system, also, a large proportion of the milk is exposed to the air, thus affording the opportunity of its absorbing any impurities the air may contain, giving the butter unpleasant taints and odors, and greatly injuring its quality.

Milk set in this manner will also be more exposed to influences pertaining to the changes in the electrical conditions of the atmosphere, as well as its temperature, than by deep setting. Both cream and milk, as has been previously shown, readily absorb any taints and odors that may be contained in the air, and this is more frequently the cause of a deteriorated quality of butter than is commonly supposed. Besides exposing the milk to the injurious action of the air by shallow setting, as has been stated, this system involves much more labor than by

the more modern system of deep setting, as it requires a large number of pans, and they must, of necessity, be kept scrupulously sweet and clean.

Deep Setting.—The old method of shallow setting for cream raising has, in a great measure, been superseded by that of deep setting, as it has been found that if a proper temperature is maintained, as much cream, if not more, can be obtained by the use of deep vessels, and also that of a better quality, than by the old system.

In a series of experiments made by Fleischman, at the Experiment Station in Baden, in the Grand Duchy of Mecklenburg, it was found that a certain quantity of milk produced by deep setting at a temperature of 40.2° in twelve hours, was 82.5 lbs.; in twenty-four hours, 89.5 lbs.

By shallow setting of the same quantity and quality of milk at a temperature of 57.2°, 80.1 lbs. of cream were obtained in twelve hours, 87.4 in twenty-four hours.

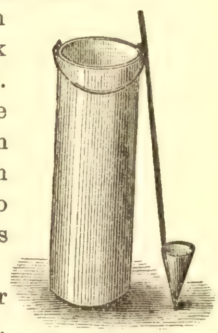
By the deep setting method a less quantity of milk and cream are exposed to the action of the atmosphere, thus affording a less opportunity for its being affected by foul air that may impart taints and odors, than by shallow setting, while a uniform temperature can be more readily maintained, and there is a saving of labor and expense, since a smaller number of pans or cans would be required.

In addition to the advantages of deep setting, already mentioned, might be cited the greater convenience of cooling the milk in summer by the use of spring water, and of warming it in winter to the proper temperature, than the old method affords.

Large, deep, open pans or vats have been used, to some extent, in large dairies and creameries for setting the milk, some of them large enough to hold the milk from a hundred and fifty cows or more. Underneath and at the sides and ends is a channel constructed, or pipes arranged, through which warm water may be kept constantly flowing in winter, and cold water in summer, to maintain a proper degree of temperature. This is an improvement upon the shallow pan system in many respects; still it is open to objection, as a considerable portion of the milk is thus exposed to the action of the atmosphere.

Another method is to construct large vats for holding water, with racks in the bottom for setting the cans upon. By this plan the water should flow through the vats.

By having the cans or pails twenty-two inches deep and filled with milk to within five or six inches of the top, and the water in the tank seventeen inches deep, a uniform temperature may be easily secured. Such cans should always be made of tin; a suitable diameter for the previously mentioned depth being eight inches. Care should be taken that the surface of the milk in the pail is not above that of the water in the vat. There should be a sufficient flow of water through the vat to remove the animal heat of the milk within an hour or less where ice is not used.



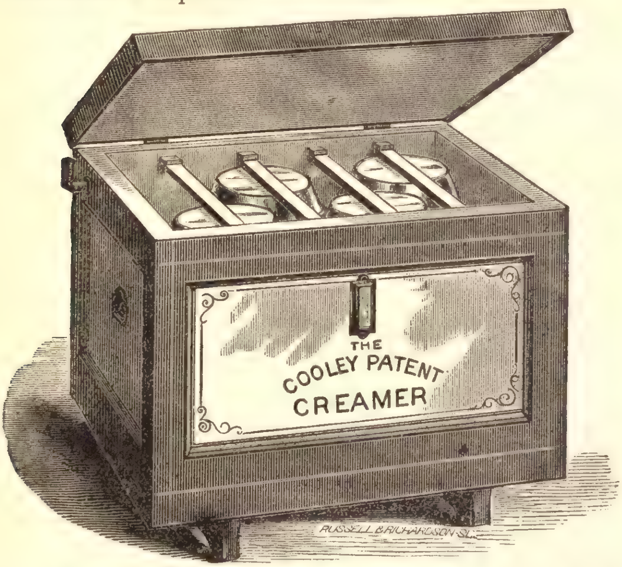
PAIL AND CREAM DIPPER AND SKIMMER.

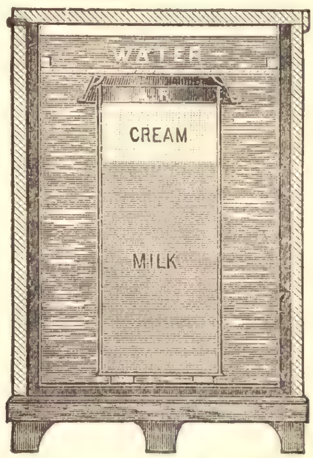
The accompanying cut represents a pail designed for vats, or for setting milk in pools; also a dipper or skimmer for removing the cream. The best method of deep setting that has ever yet been devised is in our opinion that in which the milk is kept in deep, closed cans, which are surrounded by ice or cold water in summer, or kept at a desired degree of temperature partly by ice or water, and partly by cold air. This method admits of various modifications, as the many kinds of creamers in the market at present show, the object aimed at by the inventor of each being to obtain as large a quantity of cream as possible from the milk in a short time, and while it is sweet.

According to the plan of some, the milk is entirely submerged in water, while with others less water is used. The Cooley Creamer, manufactured by the Vermont Farm Machine Company, at Bellows Falls, Vt., is a good illustration of the deep setting system.

By the Cooley process of deep setting, the cans are submerged in cold water, the water being prevented from entering the pails by the use of an inverted, pan-like lid, the flaring sides of which descend two inches below the tops of the pails and hold the air confined so that the water cannot rise over the edges of the pails. The covers of the cans fit loosely, and the top of the milk in the cans is in direct communication with the cooling influence of the water. Any odors in the milk are in the form of light, volatile gases, which quickly rise to the surface, and are absorbed by the water beneath the cover. It is well known that cold water will readily absorb any odor or taint from any other liquid of a warmer temperature, if the two are placed near each other, and this principle is practically illustrated by this method. To facilitate this process, and enable the water to more readily draw the odors from the milk, the covers are raised upon wires, as shown in the following cut of the interior of the can.

These cans are nineteen inches deep and nine inches in diameter, the covers are fastened down, and the air under the rims of the covers prevents the passage of any water into the cans. The cans are set in the water coolers, which are lined with metal, and fitted with inlet and overflow for using flowing spring water, where such is at hand. A thermometer is inserted in the front of each cooler, in order that the temperature can be ascertained without raising the cover. The apparatus is very simple, dispensing with costly milk rooms, as but little room is required.





INTERIOR OF CAN.

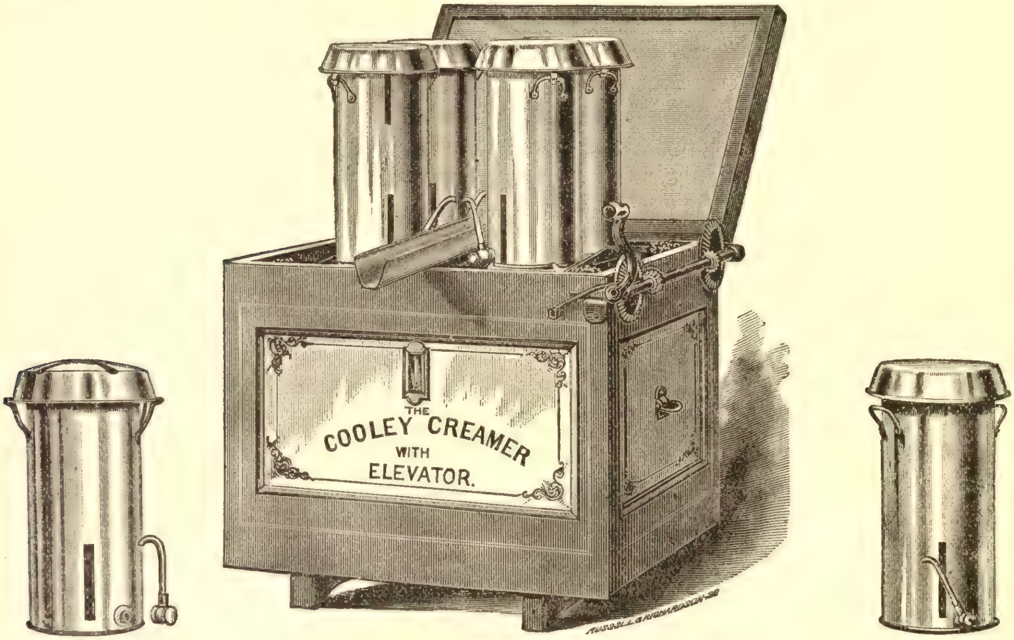
If the temperature of the water in the cooler is kept at 40° to 50° in spring and summer, and at 40° or below in winter, the cream will rise between milkings, in which case only cans enough to hold a single milking are required.

By this system of setting the milk, sweet cream is obtained from sweet milk in a short space of time.

The water should be frequently changed, for when used for a long time without removal, it becomes charged with odors that have been absorbed from the milk in the cans. At the same time this process of submerging the cans in water prevents the milk from absorbing taints and odors from the outside air, a difficulty not obviated when milk is set in any kind of open pan. It will be seen by the above description and illustration, that the covers of the cans are so arranged that all noxious gases can readily escape into the water, into which it is submerged, while the water is prevented from entering the can and mixing with the milk, and the atmosphere outside is prevented from contaminating the milk in any way.

This system of butter-making seems especially valuable in small dairies, where first-class facilities for caring for the milk have not been attained.

The cut on the left of Creamer, shows a single can as it appears when detached for any purpose, as for being washed, or for sunning; that on the right represents a can with faucet detached.

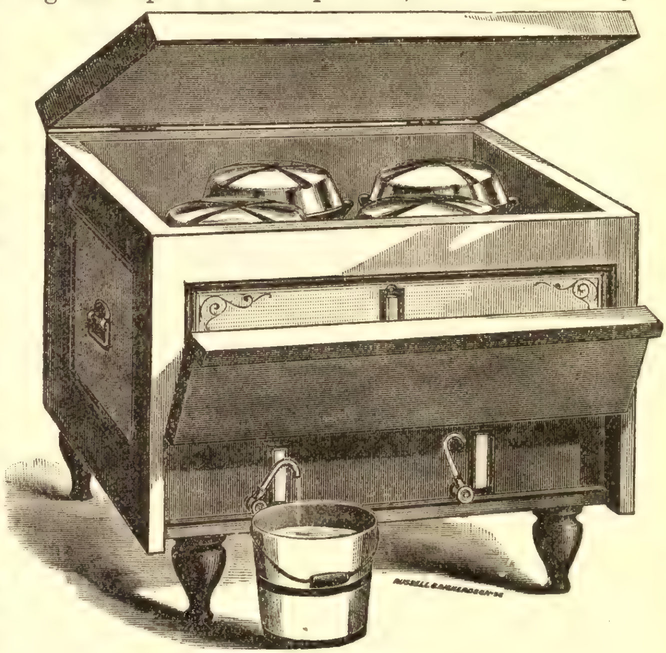


COOLEY CREAMER WITH ELEVATOR.

The cans in the above engraving stand upon a cast-iron platform, and are held firmly to it by a wedge that can be easily removed. The covers of cans are fastened to the handles with a catch, which can be readily turned in or out. The shafts over which the chains wind are provided with drums, with grooves to guide them, thus preventing the chain from winding over itself, and making it work evenly and steadily.

Several improvements have been put into the cans. Prominent among these is the new faucet, with extension tube. The faucet can be easily taken to pieces for cleaning, if necessary.

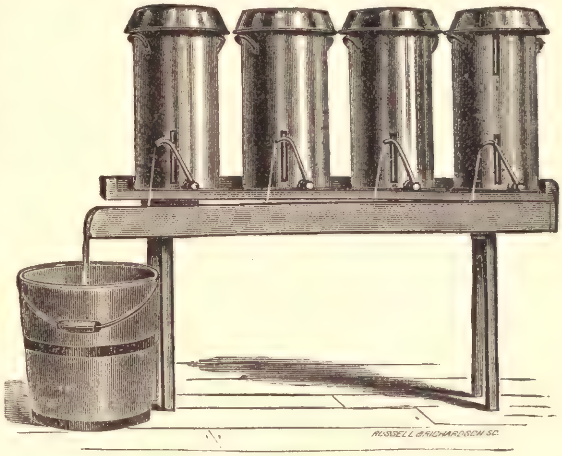
The bottom of the cans incline toward the faucet. Should any dirt or anything known as sediment get into the milk, and settle to the bottom of the can, it will be drawn out in the milk, and carried off by it.



THE COOLEY JUNIOR.

With this Creamer a galvanized iron trough is provided, running between the cans, for

conducting away the skim milk. The extension tubes are swung over the trough, and set at proper height for running out the milk and leaving the cream in the cans, care being taken to set the mouth of tubes high enough to prevent any cream running out. If by looking through the glass panel at the bottom of can, it is found the milk is not quite out, lower the mouth of tube until it is. The cream can then be poured out or drawn off through the faucet into the cream pail. This process of separating the cream from milk is so rapid an operation that the average time is less than one minute per can.

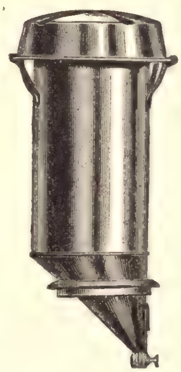


SKIMMING BENCH.

The Junior Creamer is so arranged that the milk and cream can be drawn out and separated without removing the cans from the cooler. The glass panel in the can stands directly in front of the panel in the water tank. The skimming is automatic, the same as the regular Cooley can. The cans are easily removed when necessary for cleaning, or other purposes.

The cut of the skimming bench shows a simple device to be used with the plain creamer upon which to place the cans when drawing off the milk and cream.

UPRIGHT CREAMER.



CAN.

This bench should be set with one end against the creamer, so that the cans as they are lifted out can be readily placed upon it, thus avoiding any drip on the floor.

The above cut represents the upright creamer. The upper portion is the same as the regular style creamer. The cans are made with funnel-shape bottoms, and provided with a

glass pane and an outlet faucet at the point. The side of funnel in which the glass pane is placed is nearly perpendicular, or on a line with the side of the can, the back side of the funnel tapering to that side. This construction prevents a whirlpool, as is the case where tubes or a funnel of perfect cone-shape are used. In this funnel the cream line descends unbroken, and is distinct when it arrives at the glass pane and a perfect separation can be made, which can not be done in tubes or perfect cones.

Each can is provided with metal coupling, so that it can be readily removed when desired. The figure on the right shows the can detached from the creamer.

This style of creamer is preferred by some, but it requires more care in skimming, each can needing to be watched while the milk is being drawn off. In other styles the tube is set and left, and requires no watching; it will stop itself at the right time. The other styles have advantages also in the ease with which the cans can be removed from creamers for washing or sunning.

Centrifugal System of Raising Cream.—This system of cream raising has been practiced in this country to but a limited extent. We are indebted for our facts respecting this system to Mr. Edward Burnett, proprietor of "Deerfoot Farm," Southboro, Mass., who has had several years of practical experience with this method. This gentleman has one of the largest milk, butter, and cream dairies in the Eastern States, sending his dairy products to Boston in special cars. A description of the centrifugal machine used in Mr. Burnett's dairy, will be found in connection with Model Farms (page 597, Vol. I.). It is a well known fact that the separation of cream from milk is the result of gravitation. The fat globules being of less density than the watery portion of the milk, they rise to the surface. With this fact in view, Mr. Burnett says:

"The centrifugal machine produces a very powerful and forced gravitation, which develops this separation almost instantly and with great rapidity. At 120 revolutions per minute, a weight six inches from the shaft would be equal to two and one-half times its specific gravity.

At 600	revolutions	per	minute	=	61½	times its	specific gravity.
" 1,000	"	"	"	=	170	"	"
" 2,000	"	"	"	=	684	"	"
" 3,000	"	"	"	=	1,537	"	"

As early as 1859, Prof. C. I. Fuch, of Carlsruhe, Germany, experimented with a centrifugal machine for separating cream from milk, but it was not until 1877, nearly twenty years later, that Ledfeed developed and patented a machine for the purpose. This excited much interest in Europe, and later machines were built in Denmark, Sweden, and Norway, differing, however, only as to their method of obtaining the final separation of the cream from the skim milk. In this country ten years ago, Rev. H. F. Bond, of Northboro, Mass., worked out this problem, and obtained cream in about one hour with a small, crude hand machine, consisting of two glass jars attached to a spindle and making only 200 revolutions per minute.

My own machine, patented in September, 1868, by D. M. Weston, of Boston, has probably the largest capacity of any in the world, the basket being about two feet in diameter, with a 12-inch opening on the top, and a depth of about 10 inches. It is constructed in every particular like a centrifugal hydro-extractor, with the exception that instead of the cylinder being perforated, it is perfectly tight, with a top flange extending inward towards the centre. In this cylindrical basket are ten floats or dams from top to bottom, for the purpose of compelling the fluid or milk to travel with the machine. This is substantially all, and it can be used for separating various fluids or solids of different specific gravities. Our first experiment was at 1,200 revolutions a minute, running about twenty minutes, then stopping the

machine slowly, and when at rest skimming off by hand the cream which lay on the surface in large, thick patches, and of the consistency of clotted cream.

At a subsequent trial we used a bent tube, and scooped off the cream while the machine was in motion. Now I have adopted a simple arrangement by which I catch the cream thrown over the flange already described in a stationary pan, on top of the curb, which surrounds the basket, and lets off the skim milk by valves in the perpendicular wall, which are perfectly controlled, even when at full speed. This enables me to use it as a continuous machine, and I now handle about four tons of milk daily. Having increased the speed to 1,500 revolutions per minute, we run about 80 gallons per hour.

The most favorable results are obtained when the milk is warm from the cow; it then throws off the thickest cream in the shortest space of time.

Let me here state that the pressure exerted on the walls of this cylindrical basket is 200 lbs. to the square inch, or 50 lbs. greater than a government inspector requires on a new high pressure steam boiler, so that a machine must not only be constructed of the best material, but in the most thorough and workman-like manner.

With this short description of the machine I will now give a few results from my various experiments. On the fourth of last June, mixing thoroughly all my morning's milk, 704 lbs. were run into the centrifugal and yielded 35 lbs. 8 oz., or 1 lb. of butter to 19.83 lbs. of milk. This was churned in an old-fashioned barrel churn after 24 hours, at a temperature of 50°, and the butter came in exactly 17 minutes. 660 lbs. of the same milk set 24 hours in deep pails immersed in water at 45° and skimmed very carefully by hand, yielded 32 lbs. 4 oz., or 1 lb. of butter to 20.46 lbs. of milk. This was churned after standing 24 hours at 60°, and it took 53 minutes to bring the butter. I wish to call attention to the difference of temperature in the churning of the two different lots of cream, 10° in favor of the centrifugal; and the length of time occupied with that cream only 17 minutes, against 53 of that from the pails.

About the same results in favor of a slight gain for machine were obtained from many subsequent experiments, but a neighboring farmer and butter-maker, who had rather laughed at 'Burnett's new-fangled machine,' after a good deal of persuasion on my part, this winter divided his milk, setting one-half, or 80 quarts, in small pans 24 hours, his usual method, and placed these in a cold, damp cellar at a temperature of about 55°. The other half in 10 or 15 minutes was separated by my machine and yielded $8\frac{3}{4}$ lbs. of butter against $5\frac{1}{4}$ in the pans. Making a second experiment at my suggestion, and using a tank and some of my deep pails with the same quantity of milk (80 quarts), he obtained $6\frac{3}{4}$ lbs. of butter from the machine, and $6\frac{1}{4}$ lbs. of butter from the pails. He also found, on churning, a great saving of time with the machine cream, which occupied only 11 minutes against one hour with the cream set in deep pails. I cannot vouch for the accuracy of this experiment, but will simply say that he is a very good farmer, and one that naturally would take great pains in doing it thoroughly.

Wishing to try the effect of old milk, I took July 1st and set a portion of the morning's milking thoroughly mixed in pails in a tank, the water at from 45° to 50°. The next morning, 24 hours afterwards, 165 lbs. run through the machine, yielded 8 lbs., or 1 lb. of butter to 20.62 lbs. of milk; 126 lbs. skimmed carefully in the pails by hand, yielded 6 lbs., or 1 lb. of butter to 21 lbs. of milk.

As will be observed, in all my trials there is a slight gain in favor of the centrifugal machine over the ordinary methods, and the Germans with their repeated experiments have also invariably found a gain of from 3 to 6 per cent.

The cream obtained by this method is remarkable for its peculiar sweet flavor and smoothness. Running it off slowly, then cooling below 50°, it is even thick enough to cut

with a knife. I have obtained a ready sale for it in Boston at an advanced price, and send it down every night in glass pint and quart fruit jars.

The skim milk is very thin and blue, and has a hard peculiar flavor, although perfectly sweet and remarkable for its freshness, like the cream. My chemists, Messrs. Lawrie & Terry of Boston, report the following analysis:

Water,	89.68
Fat,	.90
Casein, etc.,	4.24
Milk sugar,	4.44
Ash,	.74
	100.00

After running off the last of the skim milk we find a most offensive and greenish slime on the rear walls of the centrifugal basket, from 1-16 to $\frac{1}{8}$ of an inch thick. The following is the analysis of it:

Water,	67.38
Fat,	3.25
Ash,	3.88
Casein,	25.49
Decomposed products, etc.,	100.00

The following letter accompanying this analysis struck me as rather amusing: .

MR. BURNETT, DEAR SIR: I do not know in what quantities you get this refuse, but the best use of it I should think would be for fertilizing purposes, as it is very rich in nitrogen and phosphate of lime. Yours, etc.,

A. D. LAWRIE.

From Dr. Fleischmann's paper published in Germany, I find he also speaks of this slime as follows: 'Although the milk treated in the various experiments was always passed through four fine metal sieves before being passed into the machine, more or less dirty matter was invariably found on the side of the drum at the completion of the process. Hence it appears that the rapid centrifugal motion cleanses the milk or cream far more effectually than the best made sieve could do, and it is only natural to suppose that butter obtained from such cream should be proportionately finer.'

I asked my friend and most obliging neighbor, Dr. E. S. Sturtevant, to come up with his microscope and spend the day at my dairy. The microscopical peculiarities reported by Dr. Sturtevant, are:

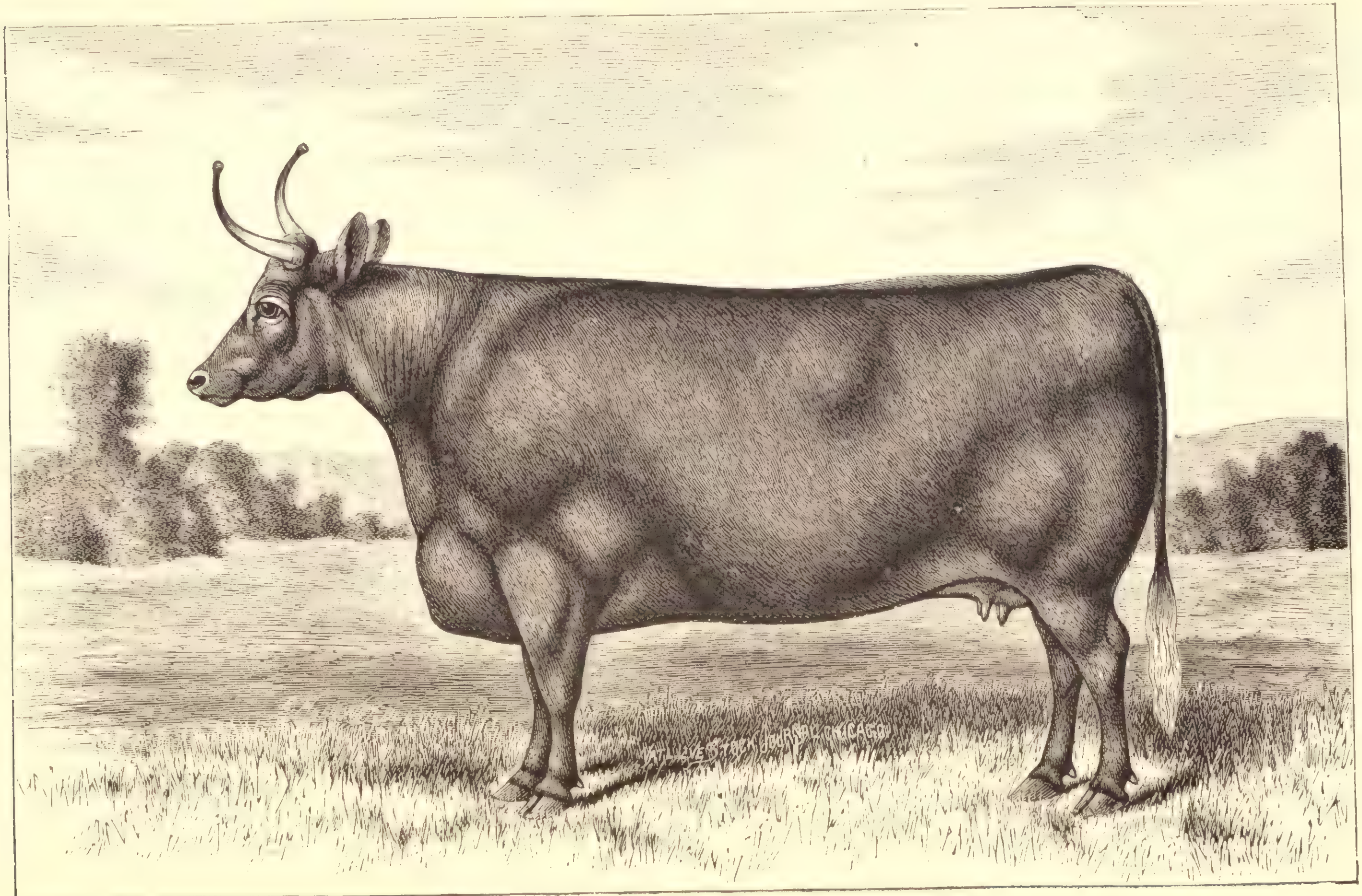
'*First* — Its absolute purity, each globule standing out distinct and round, and no foreign material of any nature to be detected.

Second — Contrary to my expectations there were no ruptured globules.

Third — There was a noticeable uniformity between the sizes of the globules of each sample. The first cream taken from the machine having larger globules than the last cream. When, however, the machine was run continuously, this should not be so evident.'

Dr. Sturtevant, as well as myself, was rather disappointed at the result obtained of the specific gravity, but I find that the remarkable result obtained by Dr. Fleischmann, of 949.6, was from a small portion of dried, thick cream taken from the uppermost surface of the contents of the German machine. Dr. Sturtevant's own result with ordinary cream of 983 was taken under the most favorable circumstances. Arnold gives his as 985; Hanneberg, 1004.9 to 1005.5; Voelker, 1012 to 1019; Letheby, 1013; Berzelius, 1024.4.

The butter obtained from the centrifugal cream is like any other good butter, except that we have noticed a slight loss of color.



NORTH DEVON COW, "HENRIETTA."
Owned by Gen. L. F. Ross, Avon, Ill.

An important fact lately developed by Dr. Sturtevant is its melting point, 98°, being remarkably high. He found exactly the same result, however, from my own dairy as from that of my neighbors', which furnished two samples from the same milk treated by the machine, and by the ordinary process, and was 98° and 94° respectively.

I have also had constructed a perforated basket for extracting the buttermilk by centrifugal force, and now treat all my butter by this method most successfully. After two or three rinsings in brine, it is removed from the churn while in small pellets and placed in a cloth. It is then put in the basket of the machine, which, in less than a minute after full speed is obtained, is brought to a standstill. The texture of the butter is fine and the grain uninjured and very solid."

The Danish machine for raising cream by centrifugal action has created considerable sensation in Europe. By a recent report made to the Danish Agricultural Society, it appears that by the centrifugal system of cream raising, one hundred pounds of butter were made from the same quantity of milk that produced but eighty-eight pounds by the deep setting process after fifteen hours setting, and only ninety-two and a half pounds after thirty-four hours setting, and eighty-seven and a half pounds in thirty-four hours by the shallow setting mode.

In making these experiments thirty pounds of milk by the centrifugal process were equal to thirty-two and a half to thirty-four pounds by the ice system (deep setting), and to thirty-four pounds by shallow setting.

In another experiment covering a month in time, it required on the average but 29 pounds of milk by the centrifugal system to equal 32 pounds by the ice system, while other experiments showed even greater differences. It was also found by chemical examination that butter made by the centrifugal system contained less water, and that the skimmed milk contained less fat.

The objection to the general use of the centrifugal machine would be its expense, unless farmers combine in order to enjoy the benefits, as they do in the creamery and factory systems.

The Fairlamb System, etc.—This system of cream-raising is comparatively speaking a new one, the can used by them having some peculiar features. It is nineteen inches and a half in height, and twelve inches and a half in diameter at the top, ten and a half inches being the diameter at the bottom. There is a tube in the centre four inches in diameter and sixteen inches high, the tube being connected with the outside of the can, at the top, by a pipe three-fourths of an inch in diameter. The can is provided with a cover of tin and rubber which excludes all air.

It has also a glass gauge marked with a scale of inches for indicating the amount of cream raised on the milk. The advantages claimed for it are, its small cost, its probable durability, that by its use cream may be raised in from twelve to thirty-six hours, according to the season and temperature, and that it requires no special place for setting in order to raise the cream.

A low temperature will raise the cream in less time than a high one. For illustration; At 32 to 40 deg. F., the cream will raise in 12 hours; at 50 to 60 deg. F., from 12 to 24 hours; and at 70 to 80 deg. F., 24 to 36 hours will be required to get the full amount of cream. It is claimed also that by the use of this can, milk can be cooled quickly or slowly, as may be desired, and that in either case there will be no change in the quality of the milk; the cream at the same time being free from all flavors or odors that may exist in the surrounding atmosphere.

The method which has been adopted in the Fairlamb system consists in gathering cream (instead of milk) from dairies by the agents of the factory. The dairies are supplied with the cans referred to above, the cream being measured by the gauge placed in the side

of the can, an inch of cream being one inch in height by twelve inches in diameter. The agent skims the cream, gives each dairy credit for the number of inches of cream taken, deposits the same in the hauling cans in his wagon, and delivers it to the factory. It is then stored until it has ripened, when it is ready for churning. By the above method a better quality of butter will be made than by the old creamery system of hauling the milk to the factories, for the following obvious reasons:

The milk, by hauling, sustains a loss in quality by generating a gas caused by the motion of the milk in the cans. The dairymen, as a rule, do not feed for the best result in cream, but feed for a quantity of milk, regardless of its richness or butter value, as the milk would only sell at the common price paid; consequently there is no encouragement for the keeping of blooded stock, or such stock as would produce the best and richest milk. It simply results in a loss to the dairy furnishing the richest milk, and becomes a profit or gain to the dairy furnishing a poor quality. It is plain to be seen that the best quality of butter can only be made by the method that pays the dairy for the milk according to its richness, instead of paying for weight, regardless of quality.

The cost of hauling cream and making butter at factories is about the same as the cost of making butter at the factories where the milk is delivered by the dairymen. By the new method there is a saving in the hauling of the milk of from three cents to five cents per pound on the butter made. Another advantage is a gain in the quantity of butter made of about one-half pound per hundred weight of milk; that is, a hundred pounds of milk set at the dairy will produce one-half pound more butter than the same milk will produce after being hauled to the factory. There is also claimed an increase of twenty-five per cent. in the butter product over the old creamery system. This is obtained by the personal attention of the dairyman in setting the milk and in having a guide or reference on the cans (the gauge), which will teach the secret of how to produce the most cream or butter. By the Fairlamb system the skim milk is left at the farm also, which is an advantage.

Other Systems.—The accompanying cut represents an improved cooling can, Tesigned to be used where cream is gathered from the dairies and paid for by the inch, as shown by the glass in the side. In this can the principle of cooling from the top is applied, ice being placed in the tight-fitting, sunken cover, a drip tube from each side leading into the horizontal airing tube. In warm weather it is set in cold water, in cool weather it may be set in the open air, and used without ice. Besides those already mentioned, there are various other modes of cream raising, each having certain peculiarites, such as Ferguson's, Clark's, Moreley's, and Butler's methods, etc. In the first-mentioned the pan containing the milk is pushed into the bureau, where, by means of ice, the milk is cooled to 58° or 60°; the second consists of a series of pans, set one close over the other, cooled by ice water running around them. The peculiarity of the third is in the cans being set in a bath of ice water, with a device to draw the milk and cream off through spouts with glass necks in the bottom, the glass being for the purpose of seeing the cream. Instead of closing the milk from the air, this has ventilators to admit the air. The last mentioned is constructed on the plan of submerging the upper half in cold, or ice water, while the lower half is in air. The cans also have a novel point in a conical glass bottom, so that the milk can be seen while escaping, and stopped when the cream appears.

COOLING CAN.

When a small quantity of water is mixed with the milk at the time of setting, a larger quantity of cream will rise in the same space of time, than without it. The quantity of butter made from milk will also be slightly greater from milk treated in this manner, but the quality will be somewhat deteriorated.

GUERNSEY COW, "ELEGANTE."
Fernwood Farm, Cazenovia, N. Y. Sweepstakes winner, New York State Fair, 1881.

Temperature for Obtaining Cream.—The best temperature for obtaining cream is generally considered to be about 60° to 62°, although some dairymen are of the opinion that 58° is to be preferred. The butter-makers of Orange County, New York, whose dairy products have been justly celebrated for their excellence, are of the opinion that the best quality of butter can be made from cream that has been obtained at a temperature slightly below 60°. It should never be above 64°. The milk serum becomes more and more dense as the temperature sinks, and offers increased resistance to the rise of the butter globules. Rapid cooling of the milk after milking will give a larger yield of cream within a reasonable time, than slow cooling. The more quickly the milk cools from the sides and bottom of the vessel in which it stands, and as a result the more promptly the currents through the milk are checked, the sooner can the butter globules move freely and without interruption through the mass to the surface. The cooling should not however go below a certain point, for as it approaches 32° the serum becomes thicker and the rise of the butter globules is consequently retarded. The temperature should be slightly higher in winter than in summer. Freezing the milk or cream injures the quality of the butter.

Quality of Cream at Different Skimmings.—As soon as the milk comes to rest after leaving the udder, the small round butter globules that are held in suspension, or floating in it, being lighter than the mass of cheesy and watery materials by which they are surrounded, begin to rise to the surface. The largest globules, being comparatively the lightest, rise to the top first, and form the first layer of cream. This will be cream of the best quality which the milk can produce, since it is less filled with casein. The fatty globules next smaller, rising a little more slowly, are more intermingled with other substances, and bring them to the surface, while the very smallest globules, rising the slowest and last, are still more encumbered with foreign substances, and will produce an inferior quality of cream and butter. It will readily be seen that richest and most delicate cream, as well as the sweetest and most fragrant butter, is that obtained by a first skimming only a few hours after the milk is set. Of three skimmings at six, twelve, and eighteen hours after the milk is strained, that first obtained will make more butter and that of a better quality than the second, and that next obtained better than the third, and so on. It has already been stated that the milk last drawn from the udder is the richest that the cow is capable of giving. If the last quart or two of a milking is set by itself, and the first cream that rises be taken off after standing only five or six hours, it will produce the richest and highest-flavored butter the cow is capable of producing, under like circumstances as to season and feed.

Butter from Sweet, and Sour Cream.—There has been considerable discussion in the past among dairymen, as to whether butter should be made from sweet cream, or that slightly sour, each method having its advocates, who claim superior advantages to be derived from their own theory and practice over the other; viz.: a larger quantity and a finer quality of butter. We believe no better butter can be produced, other conditions being equal, than that taken from the milk while it is sweet, and churned before it has become sour. The old time supposition that milk must *sour* before butter can be made from it, is erroneous, as the more common practice of the sweet cream butter-makers of the present time has fully demonstrated. Butter having a fine aroma can be made from cream but *slightly* sour, as is the custom in the Holstein dairies; but butter that is made from cream that is quite sour is destitute of this peculiar aroma, and has the taste which the Holstein butter acquires after being kept for some time.

The Secretary of the Royal Agricultural Society of England, in his "Hints on butter-making,"—a pamphlet in which he refers to the shortcomings of his countrymen in the manufacture of this dairy product, is of the opinion that one of the principal reasons for so large a quantity of poor English butter being found in that market, is in permitting the milk to be set so long that it becomes sour before being skimmed, or if it is skimmed sweet,

the cream is allowed to sour before churning, and curdy or caseous matter becomes mixed with the butter, which soon gives it a rancid taste.

In sweet cream, the hydrate of casein is less readily formed than in sour cream, hence sweet cream requires more churning than the sour. The practice of churning milk, instead of letting it stand for the cream to rise, is followed in some countries. Although very good butter may be made in this manner, it requires much more labor, and the method of first raising the cream is much to be preferred.

Churning.—Butter is the fatty substance extracted from the milk, and churning is the operation in the manufacture of butter by which these fatty particles are separated from the other constituents. By the churning process, by which means the whole mass of cream or milk is kept constantly agitated, the fat or butter globules are caused to unite in larger particles, and finally to separate entirely from the watery liquid, called buttermilk. As to what is actually taking place at the formation of the butter in the churn, chemists differ. It was the old hypothesis, and that advanced by Romanet, that each globule of fat suspended in the milk serum was enclosed in a very thin membrane, and that by the agitation or concussion produced in the churning process, these membranes burst, or were torn open, causing the butter grains to adhere together until a final separation of the fat globules, and the watery portion was accomplished.

The action being nearly alike on all the globules, the membranes enclosing them would all break throughout the whole mass about the same instant. It was also supposed by some, that acid in the cream caused the membrane to be dissolved or weakened sooner, and for this reason butter was produced from sour cream sooner than from sweet. The existence of the membrane of casein, or some albuminous matter, has however never been proved, and the theory is being abandoned by the best chemists of the present day in both Europe and this country, the present supposition being that the butter globules are simply suspended in the milk serum without any membraneous covering whatever.

Prof. Freytag, of Germany, holds to the opinion that the butter globules, although not surrounded by a solid membrane, are, however, enclosed in a thin sheet of matters formed by the commingling and condensing of casein, albumen, and milk sugar.

Dr. Soghlet, of Vienna, after many experiments, arrived at the conclusion that the fat in the milk must exist in a liquid or melted state, since the globules would keep their regular globular form, even when cooling the cream to the freezing point of water, and that by shaking or the agitation of the churning process these butter globules are made to thicken.

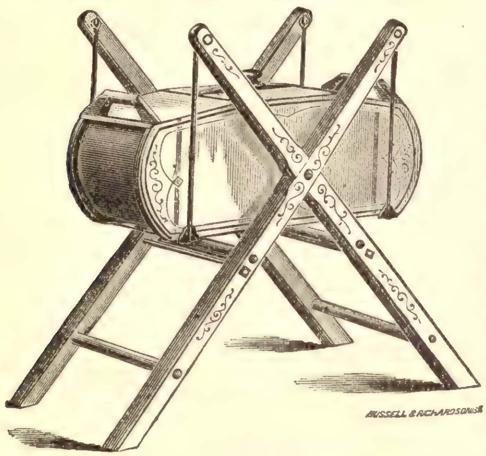
Dr. Storck, of Denmark, after considerable investigation, with various microscopic examinations at different stages in the mechanical process of churning, has advanced the theory that the formation of butter in the churn is commenced by the agglutination of the minute fat globules contained in the milk, but is completed by conglutination of the fat globules in this state by means of a peculiar substance known to chemists as hydrate of casein, produced by the churning process. Which of the many theories respecting churning is the correct one, or whether some entirely new theory yet to be advanced will supersede them all, remains to be determined; yet we believe the old one concerning a membraneous covering should be entirely set aside. We shall not attempt to decide where so many chemists disagree. Neither is it of so much importance that farmers and dairymen should understand the scientific reasons for the phenomena accompanying the mechanical process of churning, as it is to know the *best methods of doing it*, and of attaining the highest possible results in the manufacture of the butter product.

One of the most important implements in the manufacture of butter is the churn. In the rectangular churn the butter globules are caused to unite by the concussion of the whole mass of cream against the sides of the churn, and the globules against each other, as it revolves, no dashes or paddles being used. These churns are well adapted for use in creameries and large or small dairies, being fitted with cranks at both ends, and so arranged that a pulley can be attached for connecting with power, if desired.

Of these there are various kinds in use, all having more or less merit. The most common, though not by any means the best, is the old upright "dash churn;" some being made of wood and some of stone.

Then we might mention the more noted, and certainly more to be preferred Barrel, Churn, of Orange county fame. This is still much used, and with good success, in the larger dairies of the country. Then we have the Blanchard Churn, which has stood the test of use for many years, and is still held in favor by many good butter-makers.

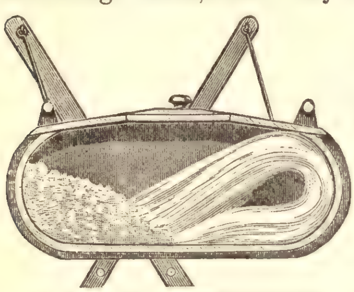
Among modern devices for churning that meet with strong endorsement are the following, the first of several shown, being the Davis Swing Churn, manufactured by the Vermont Machine Co., Bellows Falls, Vt.



DAVIS SWING CHURN.

The demand for a better grade of butter has called attention to the fact that the quality of the article depends very much upon the churn in which it is made. It is now conceded that floats and paddles inside a churn box are sure to injure the grain of the butter, the cream being whipped and beaten by them until the firm texture of the butter is destroyed, while by a swing or revolving churn this is obviated, the particles of the moving mass of cream coming in contact with each other and the sides of the churn only. The swing churn has a glass indicator in the cover, thus enabling a person to ascertain when the butter comes without raising the lid.

This churn belongs to the class known as Oscillating Churns, and is very simple in construction.

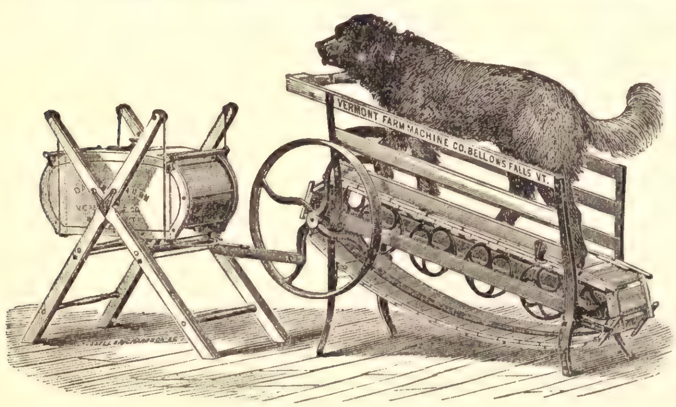


OPEN VIEW OF SWING CHURN.

The open view of the churn shows the motion of the cream in the Davis Swing Churn when in operation.

In churning, a dog, sheep, or goat is sometimes employed as a motive power in operating the churn. It is well known that either of the animals mentioned soon learns to run a churn and run it steadily,—the combination being a cheap and durable power in the dairy.

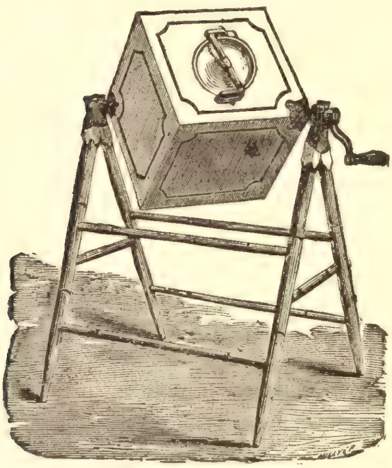
The Tartars are said to do their churning by putting the milk in a sheep-skin bottle, which they tie to the saddle, and take a brisk gallop for an hour or two; on returning the butter is made. This principle is the same as that of our best modern churns, viz.: agitation of the milk in a vessel in which the contents are dashed from one side to another to break up the globules. It is the principle of all the dashless churns. The peculiar action of these churns produces the butter in small globules, as above mentioned, and in this condition the butter milk can be drawn off and the cold water or brine introduced into the churn, and the butter thoroughly washed and made ready for packing.



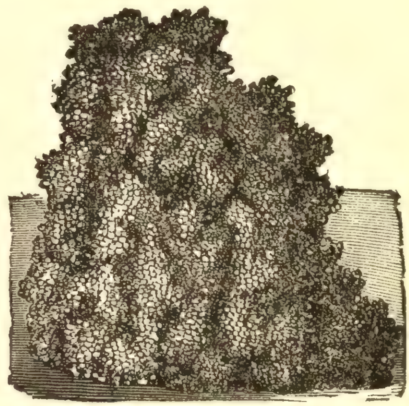
DOG AND SHEEP POWER.

The Philadelphia Dash and Blanchard churns are both provided with dashers, and may also be used with or without power.

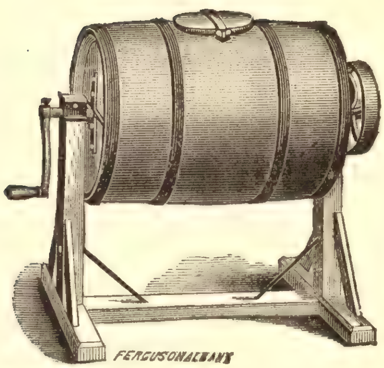
By the old process of churning the movements were perpendicular, an up-and-down motion with the dasher being employed. With the majority of churns now in use there is a rotary motion, which is a great improvement upon the old method. If the cream is thick



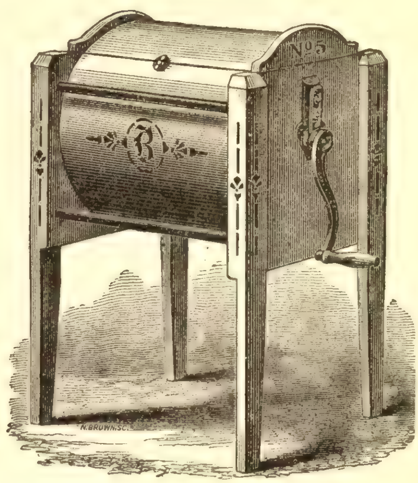
RECTANGULAR CHURN.



BUTTER GRANULES.



PHILADELPHIA REVOLVING DASH CHURN.



BLANCHARD CHURN.

and lumpy, it should be thinned with a little skim milk (not sour) of the proper temperature before putting it in the churn. Cream should not be permitted to stand very long before churning, and should be stirred sufficient to mix well when any additions are made to the quantity, in order that it may be of uniform quality throughout the entire mass. Cream that is not over twenty-four hours old, kept at a proper temperature, makes much better butter than that which is allowed to stand longer. Before putting the cream into the churn, turn into the latter a quantity of hot water, letting it stand five minutes, giving it a few dashes,

swings, or turns, according to the style of churn used; then draw off and rinse with cold water.

Never close the churn and put it away when wet, or even damp, as it will, if so treated, invariably mildew inside. The bearings should all be kept well oiled, in order to work easily. In the manufacture of butter the utmost cleanliness should be observed in every respect, and strict attention paid to what might be considered the "little things" in dairy management, as any neglect in one particular might spoil a large quantity of butter. In the first place, cows should have good pasturage, or a suitable quality and quantity of food, and proper management; due attention should be paid to cleanliness in milking, to setting the milk, avoiding all taints and odors in the atmosphere that comes in contact with it, and to churning the cream, salting and working the butter, etc. Cream that is set where the odors of cooking food can come in contact with it will readily absorb such odors, and take their flavor. Butter is often spoiled by setting the milk in wooden or earthen vessels that readily absorb taints from decomposing cream or milk, and which no washing or scalding could remove. The use of old rusty tin pans or cans in setting milk will also cause the butter to have a bad flavor. The cans or pans used should therefore always be sweet and clean and free from rust.

Hon. Hiram Smith, of Sheboygan, Wis., a recent winner of the sweepstakes of $250 at the International Dairy Fair at New York, gives his method of butter-making, as follows:

"As soon as convenient after milking commences, the butter maker begins to carry milk into the butter room, and strains into Cooley cans, and immediately submerges them in tanks, in which water is running. and, as soon as the milk becomes as cold as the water, the water-pipe is removed and sufficient ice added to reduce the temperature to 45 degrees. This tank is then closed until just before the next milking, when the can is taken out and the milk drawn off and the cream added to a previous supply of cream, and the milk-can refilled and submerged again. In other words, the cream taken from Monday nights' skimming should be added to Tuesday mornings' skimming, and the whole cream thoroughly stirred; and in cool weather the temperature raised to 62 degrees, and kept in about the same condition until Wednesday morning. By this time the cream has ripened and become slightly thickened, with a little acid perceptible. When it is in right condition to churn, the temperature should be, when churning commences, 60 degrees in warm weather, and 62 degrees in cold weather; coloring matter added just before churning. Practice will determine the amount, as it will depend on the season and on the kind of feed used. The churn should be one that agitates the cream uniformly, so that the butter will all come at the same time. (I use the Rectangular.) As soon as the cream breaks into small pellets of butter the size of wheat kernels, the churning proper is done; add a pail or two of cold brine, then make a few revolutions of the churn, draw off the buttermilk and add brine to wash off the buttermilk; when allowed to drain a few minutes, add salt, one ounce to the pound of butter; make a few revolutions of the churn, and the butter comes together, free from buttermilk, and evenly salted. It is then taken out of the churn and placed on a lever butter worker, slightly worked, and then covered with a cloth and allowed to stand three or four hours, when it is reworked just sufficient to pack nicely, which should always be done before it becomes hard with the cold or soft with the heat, and the package kept in a cool place until the butter is eaten or sold. Good, healthy milk, treated as above, will in all cases produce first-class butter, irrespective of the weather — good to eat when new, and will keep the best of any method of which I am acquainted."

Temperature of Cream While Churning. — The temperature of the cream when it enters the churn should be between 53° and 55° F. During the process of churning it rises several degrees; the temperature while churning which is considered most favorable

for gathering the butter is from 66° to 68° F., this rendering it of proper softness and adhesiveness. If the cream is too cold while churning, the butter globules, being hard, will not unite as readily; while if too warm, they will be in a semi-fluid state, and consequently will not unite for this reason. Care should therefore be exercised to keep the cream at a proper temperature. It is generally conceded that the cooler the cream can be kept, and at the same time have the fat globules of a suitable temperature to unite, the better. It is generally known that the melting point of butter made on dry hay is a trifle higher than that produced on grass, or while feeding with oil cake, the quality of the feed influencing the character of the butter globules. This explains why it is sometimes necessary to churn a few degrees warmer in winter than in summer.

Time Required for Churning.—The time required for the butter to separate, as well as its quality and quantity, depends much upon the temperature. Half an hour, at least, is considered essential for churning by experienced dairymen, and from forty-five minutes to one hour when the quantity of cream is large. If the butter comes much sooner, it is liable to be soft and frothy; while if a much longer time is required, the butter will have a bad flavor. By a gentle, slow motion in churning, the butter leaves the churn in a better condition, and requires comparatively less working to extract the buttermilk. A good authority on this subject says:

"When butter is to come in a few minutes by violent agitation, as in the strife for the repute of quick work in case of trials of new churns, there is obtained, instead of good butter in dense and large clumps, a doughy mass consisting of little balls of fat mixed with buttermilk and cream, and full of air bubbles, which no skill in working can convert into good butter. While it is true that violent churning will produce a greater weight of so-called butter, it is demonstrated by chemical analysis that the milk or cream thus treated does not yield so much of its fat as is obtained by slower and gentler agitation. The greater weight of the product is due to the admixture of buttermilk, which is retained in the spongy mass. The fact that churning must go on for some time before any visible change is effected in the cream, and that the butter 'comes' somewhat suddenly, is due to the exceeding minuteness of the fat globules, of which myriads must unite before they attain a size visible to the unaided eye."

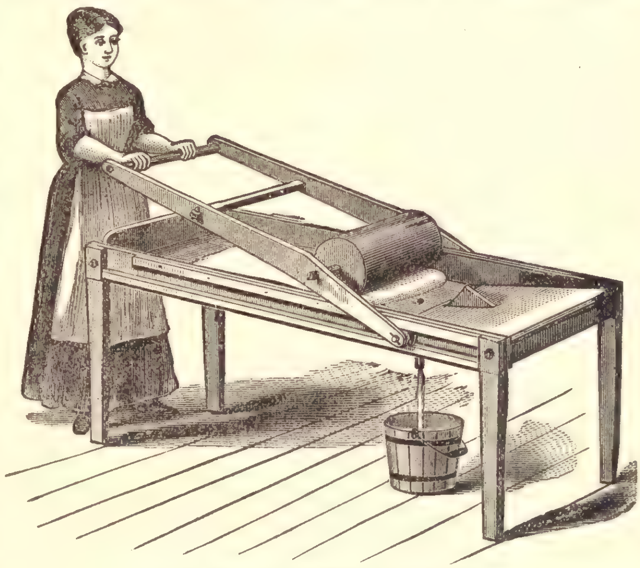
As the buttermilk begins to appear, if a moderate quantity of water or brine at a temperature of 56° or 58° is added, the butter separates very rapidly.

Washing Butter.—In order to have butter keep well, without danger of rancidity and loss of its fine flavor, great care should be used to remove the buttermilk as completely as possible. It is a good plan to draw off the buttermilk from the churn, and turn in cold water in sufficient quantity to wash it thoroughly, after which a few revolutions of the churn will wash out the buttermilk. It can never be wholly removed by simply working or kneading the butter. Casein prevents butter from keeping well, and can only be removed by thoroughly washing it.

Some dairymen prefer weak brine to water for washing; in either case the butter should be washed until the water or brine comes out clear. The butter should not be permitted, however, to remain long in either water or brine during the washing process; the quicker and more thoroughly this can be done the better. It should be remembered that all brine used in washing butter should be carefully strained through a cloth before using, to remove any specks it may contain. In Holland it is customary to mix a considerable amount of water in churning, the butter thus being partially washed as it comes; besides, the butter is afterwards thoroughly washed with water. Butter thus washed is remarkable for its keeping qualities. Holstein butter makers put water in the cream while churning, but do not wash it afterwards. This butter has at first a delicious aroma, but does not keep as well as butter

that is washed. Swedish butter, made according to Gussander's method, in which the cream is raised in twenty-four hours at a temperature of 60° to 75° F., is prepared without water, and has a very fine flavor; but it will not keep any length of time, unless it is thoroughly washed before being salted. Salt removes but little from butter except water, and a small amount of sugar. The water used in washing butter should be entirely free from all impurities or flavors, such as a disagreeable taste imparted by a pump with pine tubing, or the impure water of some cisterns.

Salting Butter. — A little salt is generally added to butter to improve its flavor. It is also necessary to preserve butter that is to be kept long; butter can, however, be kept for some time without salt. Salt aids in removing buttermilk or water from the pores of the butter, and tends to prevent the casein and other matters that cannot be removed, from becoming rancid. The amount of salt to be used will depend, in a great measure, upon the time the butter is to be kept. Many dairymen use but a quarter of an ounce of salt to a pound of butter, when it is designed for immediate use; but when it is to be packed away for winter use, or kept for a considerable length of time, the general rule for salting is an ounce of salt to a pound of butter, although some use but three-quarters of an ounce of salt to a pound. Over-salting renders butter less palatable to the taste, and is less healthy as an article of food than fresh, sweet butter.



THE EUREKA BUTTER WORKER.

Never guess at the amount of salt to be used; first weigh the butter, and add the proper proportion of salt. Greater care is necessary in selecting the salt for butter than most dairymen are aware, as even the smallest quantities of the chlorides of calcium and magnesium in the salt will give the butter a bitter and unpleasant taste. These are the common impurities of salt. Salt should always be kept in a dry, pure atmosphere. Foul gases and taints may be absorbed by salt, although it is preserving in its nature. Salt that has been kept in a damp atmosphere, and exposed to the odors of decaying vegetables, cesspools, the cooking of cabbage or onions, etc., is not fit to be used in butter. It should never be left open to gather impurities, such as dust, crumbs from the pantry, etc. Butter is often spoiled by a neglect of such care. The *pure* fat of butter may be kept for months without becoming rancid; but by the usual modes of butter making buttermilk cannot be entirely removed, and the casein contained in it acts as a ferment upon both the sugar and the butter, the casein becoming changed to lactic acid.

Working Butter. — The object of working butter is to free it from the buttermilk it contains, and to distribute the salt evenly through the entire mass. It is well understood that the less manipulation the butter receives to accomplish this end, the better for the butter, as its grain is injured by much working. In working, the hands should *never* come in contact with the butter, as it will injure its quality.

There are various kinds of butter workers in the market, each having their respective

merits. Those which operate in such a manner as to expel the buttermilk with the least injury to the grain are, of course, the best. The Eureka worker is so constructed that all portions of the butter are equally worked, with even pressure, no drawing or sliding motion possible. The buttermilk is drawn off by a pipe underneath; the butter is rolled out into a thin sheet, a portion of salt is sifted on, then by a quick backward motion of the roller the butter is turned bottom side up or folded in the tray, rolled out again, more salt sifted on, again turned and rolled. This operation is repeated until a sufficient quantity of salt is sifted. The salt is then so evenly distributed that the butter is ready for packing without a second working.

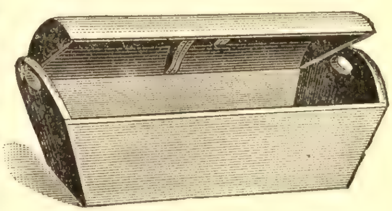
LEVER BUTTER WORKER.

In the use of the lever worker, care should be taken to give an equal pressure to the entire mass of butter.

Before using any butter worker, hot water should be poured over it and the tray, making sure that all parts are wet with the hot water; when, after allowing it to stand for a moment, run it off and cool the "worker" with cold water.

Some prefer, after salting, with a slight working, to put the butter away in a cool cellar or ice-box, allowing it to remain till the salt is thoroughly dissolved, and then finish in the butter worker.

Before completing the working of butter, all moisture should be removed with a sponge or towel, and all butter clinging to the sides of the tray should be removed.


BUTTER TRAY.

The butter tray of which we give an illustration is designed to hold the butter when taken from the churn, or worker, to be reworked, packed for market, and is very convenient for such a purpose. The oval cover, which is made to fit tight, in order to exclude dust, flies, and foul air, also increases the capacity of the tray. These are made to hold any amount of butter from forty to one hundred and twenty-five pounds.

The Grain of Butter.—The description of the "grain" of butter is given by Willard, as follows:

"What is meant by the term grain as applied to butter, is a waxy appearance, and the more it resembles wax in its appearance the better the grain. When properly churned, both as to time and temperature, the butter becomes firm with very little working, and is tenacious. It then may be easily molded into any shape, and may be drawn out a considerable length before breaking. It has a smooth and unctious feeling on rubbing a little between the finger and thumb. When the grain is injured the butter spreads like grease, and the more it resembles grease the more is the grain injured. Good butter that has not been injured in the grain will not stick to the knife that cuts it. Butter that has no grain is brittle, and when broken presents a jagged surface and will not spread with that smooth, waxy appearance belonging to good butter. It is only when butter has this waxy consistency that it preserves that rich, nutty flavor and smell which impart so high a degree of pleasure in eating it. So it will be seen that there is very good reason for consumers rejecting butter that has been overworked into grease, even though it may have all the essentials of the best quality when taken from the churn.

A great deal of good butter is spoiled in the working. There are vast quantities of butter to be found in the markets, of good color, properly salted, the buttermilk expelled, and yet it has a mussy look and lardy taste. Consumers are often at a loss to account for it. The butter is not rancid nor has it any disagreeable odor, but it is poor nevertheless. This butter may have been made from the nicest cream, with the utmost attention to cleanliness in every branch of its manufacture, from the drawing of the milk to its packing in the firkin. The maker perhaps has expended all her knowledge and every resource within reach to get a prime article, hoping for a name in the market, and an advanced price for a really "tip-top" article. And when the expert affirms that the butter is inferior, and must be classed as second or third rate, it is very disheartening, and some give up in despair of ever learning the "knack" of manufacturing a strictly nice grade of goods. They cannot imagine why butter, upon which so much care and attention has been bestowed, should be condemned as having a greasy look and taste. If .inquiry be made concerning the fault in manufacture, the dealer, if he be an expert, will be very likely to say, "My dear sir, or madam, your butter has no grain."

Coloring Butter.—A rich golden color renders butter more marketable, as well as attractive for table use. As a general rule, good grass butter needs no coloring; but it is generally found necessary in winter to color butter, unless cows are fed largely on carrots, pumpkins, yellow corn meal, etc. Annatto is the substance most generally employed for this purpose. The pure article should be used, and when so, it adds nothing to the flavor of the butter, is free from sediment, and is quite harmless. It may be obtained in liquid form, prepared especially for dairy use. The quantity to be used must be determined by experiment, according to the season, conditions, etc. It should be put into the cream before churning, by which means it becomes uniformly mixed, giving the entire mass the same shade of color.

When the dry annatto is used, it should first be dissolved in warm milk or water, and strained through a cloth, to prevent the mixture of sediment. Deep yellow carrots are frequently used for coloring butter. The carrots for this purpose should be thoroughly cleansed, and the outside portion (which is of the deepest yellow color) grated and soaked in boiling milk for ten or fifteen minutes, and afterwards strained through a fine cloth and added to the cream. Carrots are thought by many to impart a sweetness of flavor to butter, resembling that obtained when cows feed upon grass, besides giving it a natural color.

Packing Butter.—When butter is to be kept for a considerable length of time, or transferred to a distance, it will be necessary to pack it in jars, firkins, or boxes. Stone jars are the best for this purpose, when the butter is to be used at home; but would be liable to become broken by transportation. When boxes and tubs are employed for packing, such

woods should be used in their manufacture as will not impart a disagreeable flavor to the butter.

Ash is regarded as objectionable, since it contains an acid; while spruce, pine, and other gummy woods impart a very disagreeable flavor to butter. Oak is highly recommended and extensively used for this purpose, but it should be thoroughly seasoned before using, as the sap exuding from the wood would impair the flavor as well as the color of the butter. Sugar maple is also excellent for this purpose. When properly steamed under a pressure, which process forces out the sap, many kinds of wood that would otherwise be objectionable may be used for this purpose.

Firkins and tubs should be prepared for packing by pouring boiling water into them and leaving them to soak twenty-four hours, after which fill with strong brine for two or three days; turn out the brine and rinse with pure cold water; then rub the sides of the tub with fine salt, and sprinkle a little salt in the bottom. As soon as the butter is worked, put it into the tub and pound it down solid. Fill the tub within an inch of the top; then cut a cloth one inch larger than the surface of the butter, wet it in brine and spread over; cover this with a layer of salt about half an inch; another cloth one inch larger than the first, and spread over, turning up the edges on the inside of the staves. Care must be taken not to let it hang over the top, as it will then draw out the brine. Fill the tubs with fine salt, fit the cover on tight, and pour strong brine through a plug-hole in it, in order to fill all the intervening spaces and exclude the air, after which put in the plug and keep the butter in a cool, dry, well-ventilated cellar.

Even butter that is packed in this manner will absorb gases from decaying vegetables and other foul odors, consequently it must be kept in a pure atmosphere. Some put a cloth in the bottom of the firkin before packing. Another method of packing preferred by some dairymen is as follows:

Make a bag of common bleached cotton cloth, a little smaller than the tub, so that when it is filled there will be a space of at least an inch all around on the sides, above and below. Pack the butter in the bag, and put the bag in the tub; fit on the cover with a hole an inch and a half in diameter in the centre; then turn in strong brine sufficient to fill the tub even full. Put in a plug reaching an inch below, so as to keep the butter under brine. The sack of butter will float in the brine and be excluded from the air. The butter should never come in contact with the cover in packing. In the preservation of butter, the exclusion of air is of the utmost importance. It is also highly essential that the buttermilk be entirely worked out before packing, as the casein contained in it ferments and causes rancidity.

White Specks in Butter.—Although there may be other causes for white specks in butter, they are caused mainly by the milk in the cream curdling while the cream is at too low a temperature, or from permitting the milk to become sour or curdled before skimming, and a portion of the same becoming mixed with the cream. Mr. H. Stewart says relative to this subject:

"The condition of the cow, caused by several circumstances, such as disturbed health from various causes, and the period of œstrum, will all produce this state of the milk; but these must all be so apparent that they would lead one to suspect their influence at once. I believe these white specks in butter are due in nine cases out of ten to the curdling of the milk in the cream, and the separation of the whey from it. Every time that I have had white specks in the butter the bottom of the cream can has contained clear whey, and of course the curd must have separated and have mingled with the cream. The white specks were all clearly apparent as the butter was taken from the churn in the form of small grains, and were evidently nothing more or less than clots of curd. If these had not been carefully picked out from among the grains of butter they would have been worked up among them, and have appeared as the ordinary white particles which trouble the butter-makers so often."

The remedy is, of course, to remove the cause, by skimming the milk before it becomes too sour, and to avoid keeping the cream so long or at so warm a temperature that the milk in it will curdle. We prefer sweet cream taken from sweet milk for butter, and believe no degree of souring, either for milk or the "ripening" of the cream, as it is termed, will produce butter of so good a quality as the former, although we are aware that a difference of opinion exists on this subject.

Rancidity in Butter.—Rancidity in butter may be corrected somewhat by melting affected butter and pouring it into ice-cold water. As a means of retarding rancidity, in some parts of France butter is melted and kept heated till the water it contains is evaporated, when the casein which appears as a scum on the surface is skimmed off; but the butter so treated loses much of its flavor.

To protect butter from rancidity, some dairymen, besides salting the usual amount, add white sugar and saltpetre, in the proportion of from one-fourth to one-third of an ounce of each to every pound of butter. Butter that has become rancid can be greatly improved by cutting it in very thin slices and putting it in a rotary churn two-thirds full of new milk, washing it thoroughly in this. New milk will dissolve and wash out the butyric acid. The butter should then be washed with very cold, pure water, and slightly resalted with the following preparation:—To every eight ounces of salt, add two ounces each of saltpetre, and the same amount of pure white sugar; mix these ingredients, and add from a half to three-quarters of an ounce of it to a pound of butter.

Adulteration of Butter.—Butter is of such a nature that it affords great opportunity for adulteration, and the rendering of the detection of foreign matters attended with considerable labor and difficulty. The chief adulterants are other animal fats, such as lard, beef, and mutton tallow, together with certain vegetable fats. Such adulterations may be suspected by their characteristic smell, and detected by their different melting points; by microscopical examination, and by their solutions. It can also be detected by the grain, oleomargarine never having that waxy appearance and fine grain that butter has, and will usually cut very different from butter, either being harder and more inclined to crumble, or to adhere to the knife like lard. When beef fat is used to adulterate butter, it renders it more hard and inclined to crumble; but when lard is used, it will be more liable to adhere to the knife. Professor Michels, a competent microscopist of New York, after subjecting oleomargarine to a thorough examination under the microscope in comparison with natural butter, says:

"It will be noticed that the large feathery crystals are characteristic of oleomargarine, and that the general appearance of the sample is different from that of butter, which merely shows the fat globules observed in milk, with here and there a crystal of chloride of sodium, or common salt.

Animals used for food are subject to the attacks of internal parasites that lodge in countless multitudes in all parts of their bodies. Some of the most dangerous forms of these pests will also live and thrive in man. The trichinae which enter the body, at once breed by the million, and invade the whole system from head to foot. *But one protection exists* by which man can guard himself from the contagion of these pests that annually carry off millions of the brute creation, and that is the practice of *thoroughly cooking all animal substances intended for food.*"

He also states in the same connection that in the process of manufacturing oleomargarine, it is never subjected to a higher temperature than 120° F., and that any germs of disease, morbid secretions, and embryos of parasites in the animals from which this oil is obtained are thus liable to be transferred in a living condition into the system of those who make use of butter made from such material. It is a well known fact that living organisms have withstood a temperature much higher than the caul fat is subjected to in the preparation of

oleomargarine, the germs having been found alive even at 190°, and that it is impossible to kill the animal life in beef fat at a temperature lower than 212°. One of the leading microscopists in the Western States says of oleomargarine:

"The greatest danger is, that much of the oleomargarine manufactured from refuse fats, may be a highway through which the eggs of animals, larvae of bees, etc., find their way into the stomachs of men. These eggs, larvae, etc., are known by the name of entozoa. They are formed by myriads in the intestines of many animals, and are only surely killed by a temperature of 212°. When these worms reach the stomachs of men, the embryo is liberated, and after penetrating the mucous membrane, it burrows its way, or is carried by the blood currents, to some distant organ, where it is lodged, but presently reappears as a hydatid vesicle. It is manufactured in immense quantities and sold to dealers, who mix it with real butter, and sell it as such. The men who mix it and sell it thus fraudulently are the ones who ought to be punished."

Not only should those who sell this spurious article be subject to the penalty of the law, but those who manufacture it and put it upon the market. The manufacturing and circulating of counterfeit money is prohibited by law, and those who violate this law are punished by the penal laws of the country, and we see no reason why those who make and sell spurious butter or any other article of food, drink, or medicine should escape punishment for that which should be regarded as felony in law,—a felony of a far more serious character, and requiring severer penalties than the laws impose respecting those who counterfeit money, or knowingly issue the same, the gravity of the offense respecting counterfeits or adulterations of butter, or other foods, drinks, or drugs, *or issuing the same, knowing them to be counterfeits or adulterations*, being very properly measured by the probable consequences to the public health and the average duration of human life, through the use of these noxious compounds.

The experts of oleomargarine are nearly equal to those of butter in this country, and this fraudulent article is what the dairymen have had to contend against for several years, to the great detriment of the dairy interests, and the reputation of American butter abroad.

English Butter-making.—One of the highest authorities in dairy matters in England recommends the following method of butter making, which he says is adopted in the best districts of Normandy, the butter from which sells at the highest price in the Paris market: "Clean all dairy utensils, first in cold water, secondly in hot water, and again in cold water. Cool the milk by placing the cans in cold running water; then set it in deep pans at a temperature not above 55°; skim with a perforated skimmer after setting twelve hours, using care that only cream is taken off. A second skimming may be taken twelve hours afterwards; but this is not to be mixed with the first. The largest quantity of butter does not give the best quality—therefore make two qualities.

The best butter cannot be made of cream from sour milk. Churn the cream at a temperature of from 57° to 60° in a revolving barrel churn, making forty to sixty revolutions per minute. The churn should be ventilated often during the first ten minutes. Learn by the sound when the butter has come in globules the size of a pin-head, then draw the buttermilk. [Some American authorities say that the globules should be as large as a pea.] To prevent loss, pass the buttermilk through a hair sieve. Wash the butter well with cold water till the water comes off clear. Press out the water in the butter-worker and add salt in the proper proportion."

French Butter-making.—By the French system, butter is made from very sour cream, is washed in pure water in the churn, and being for the most part sold for present use in the home market, no salt is used. The best French butter is shipped at once to the consumer. It is put up in large balls of twenty-eight pounds to forty pounds, each ball being covered by a piece of fine flannel and placed in a willow basket. Second and third class butter

is made up in one pound rolls and placed in grape leaves. For the English market, butter is put up in one pound rolls and covered with jaconet and lace paper, and packed in small boxes 14 x 9 x 6 inches, twelve rolls in each box. M. Lepelletier, the largest exporter of this kind of butter, ships it in refrigerator cars at the rate of 12,000 boxes per week. The different kinds of butter are named from the places where they are made, and classified according to quality.

Philadelphia Butter. — The manufacture of the famous "Philadelphia print" shows that great care, uniformity, and system characterize all its processes. The milking is done quietly and rapidly, the same milkmaid always attending to the same cows. The spring-house is usually of stone, on a side hill, the floor covered with running water, and therefore always cool and free from odors. Deep tin pans, painted on the outside, with bails for handling, are filled to the depth of three inches, placed on an oak floor, and surrounded with cool, clear water of a temperature of 58°. The cream is taken off in twenty-four hours, kept in deep vessels holding twelve gallons, and stirred whenever a new skimming is added. A barrel churn is used, the churning lasting an hour, when a little cold milk is added to cause the butter to gather. The buttermilk drawn off, ice-cold water is twice added, a few turns given to the churn each time, and the last water is scarcely colored with milk. A gentle rocking motion of the churn soon collects the butter, which is left two hours to drain off the remaining water through a small hole made for the purpose. The butter is worked by a corrugated wooden roller, revolving on a shaft supported over the centre of the table, which also revolves under the roller. Beveled blocks at each end of the roller force the butter from the ends toward the centre, so that the rolls are broken each time in fresh places. The roller does not quite touch the table, and there is no crushing of the particles, but a separation of the mass with a slight pressure which permits water or buttermilk to flow away. A cloth which has been wrung dry in cold spring water is repeatedly pressed upon the butter until not a particle of moisture is seen upon it as it comes from the roller, and the butter begins to adhere to the cloth. This is called "wiping" the butter. An ounce of salt to three pounds of butter is then thoroughly worked in by the aid of the same machine. Thus the processes are all conducted without any manipulation of the butter by the human hand. It is finally weighed out and put up in pound prints. One hundred pounds are churned in one hour and prepared for market in another, and deposited in tin trays and set in water to harden. The next morning it is wrapped in damp cloths, each pound by itself, put in a tin case upon wooden shelves, with two compartments of pounded ice to keep it cool, and surrounded by a thoroughly made cedar tub; it is sent to market, and often sold at a dollar a pound.

Butter Yields, or How Much Cream for a Pound of Butter. — The proportion of butter produced by milk varies largely according to the breed, season, feed, etc. According to Willard's statement, it is usual to reckon twenty-five pounds of milk for a pound of butter, as an average from the common cow. Some factories report a pound of butter from twenty-two pounds of milk, and some even less. It must be remembered, however, that *fat* is the chief variable constituent of milk, depending largely on breed of cow or selection, food, etc. When we speak of a pound of butter from twenty-five pounds of milk, we assume there has been no particular selection of the common cows as butter producers, and that they are fed upon grass alone, or with no extra feeding to stimulate an extra yield of butter.

The editor of the *National Live Stock Journal* gives the following report concerning the butter yield of cream, which contains so much valuable information that we quote it entire:

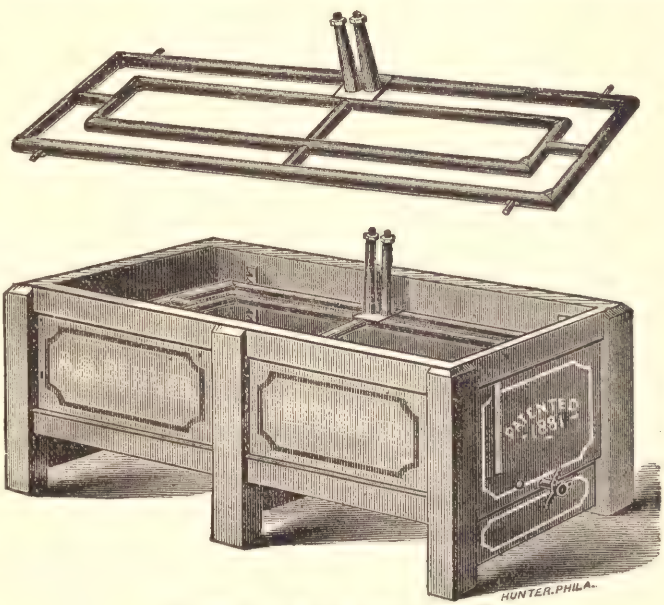
"In the Fairlamb system, and in others similar to it, 113 cubic inches, or almost two quarts, are taken from the patrons of a creamery for one pound of butter; and the average result proves this quantity to be nearly correct. It oftener falls short than overruns, so that two quarts, which measure 115½ cubic inches, would be nearer the measure required. This

is the result in *one* mode of raising the cream. Every variation in the mode of creaming milk varies the quantity required for a given weight of butter. The more refrigeration there is used, the more cream for a pound of butter, because in the cold processes the milk is less perfectly separated from the cream. When raised at a high temperature, as when the milk is scalded before setting, the separation of the cream is very complete. The cream is then almost pure butter, and it takes but a little more than a pound of cream for one pound of butter. When raised in the open air at 60°, the bulk of cream is between the extremes. Thus it will be seen that the value of cream is a very indefinite quantity. It depends altogether upon how much milk goes with it, and this, in turn, depends upon the manner of raising and skimming. People are quite prone to speak of cream as if it was a single and uniform substance, composed only of the fat globules of the milk; but we never, or very seldom indeed, get it in such a state, it being always more or less mixed with milk. Cream varies also in its value for butter production, on account of the breed of cows from which it is obtained. Derived from Jersey milk, its separation from the liquid part of the milk is very complete, by reason of the very large size of its cream globules, which come to the surface quickly, and with less liquid adhering to them. Then cream from Ayrshire milk is usually very compact, being composed of large and small globules mixed, the smaller ones filling in and occupying the spaces between the larger ones, just as small potatoes or small apples fill in between larger ones, and give more weight to a given bulk than if measured separately. In one case, 100 lbs. of Jersey cream produced 56.8 lbs. of butter, while another sample of cream from common stock gave only 18.18, which is less than one-third of the yield from the Jersey cream. These are extreme cases, but inside of these extremes the value of cream for butter making is continually oscillating one way and the other, so that it is impossible to give it any specific value either by weight or measure.

There are some curious things about cream not well understood, which stand in the way of making any definite inferences from its bulk or weight. Two samples of cream, showing by exact analysis the same percentage of fat, are liable upon churning to yield very unequal quantities of butter. This is so generally true that there would be no more reliance upon a chemical analysis of cream to determine its value for butter than there would be upon estimating it by its bulk. Neither will an analysis of a sample of milk afford anything more than a vague and uncertain indication of the percentage of cream which will rise on it, or of the butter it is capable of producing. It is as useless to analyze milk with a view to finding out how much butter it would make, or how much cream would rise on it, as it would be to analyze a soil to find out how much grain it would produce. The uncertainties which are thus seen to attach to cream suggest very forcibly that the percentage which may rise upon any particular specimen of milk can be no certain indication of the capacity of that milk for producing butter. The variations in the butter product from a given percentage of cream have been found in individual cases to vary from 300 per cent. down to nothing — that is, the product of butter from a given percentage of cream upon two samples of milk may be alike, or one may be three times as great as the other. In the case of the mixed milk from any considerable number of cows, these individual idiosyncrasies balance each other, and give a pretty uniform result. Dairymen are sometimes advised to test their cows' capacity for butter making, by setting their milk separately and noting the percentage of cream which rises on each, and to reject those which give a small depth of cream; but such a course might drop out the best butter cow in the dairy. The cream or milk should be churned, and the comparison made between the butter products instead of the cream. The lack of uniformity in the value of cream is well indicated by the variations in its specific gravity. Hardly any two observers make it alike. Thus, with water at 1,000 as a standard, Berzelius made the specific gravity of cream 1,024.4; Dr. Voelcker, 1,012 to 1,019; Letheby, 1,013; Henneberg, 1,005.5; L. B. Arnold, 985; Dr. Sturtevant, 983. These widely differing results have

doubtless been obtained by reason of unequal admixtures of milk with the samples tested. The gravity of pure cream should not differ much from pure butter fats, which have a specific gravity of about 945. They are lighter than water, and so is sweet cream, for it always floats on water. Occasionally sour cream, by being loaded with sour milk, sinks in water; but it would not do so except for the milk with which it is entangled. Jersey cream, which separates quite perfectly from the milk, is often more than half butter, while the cream which produces but 18 per cent. of butter must be largely diluted with milk. As the gravity of pure cream must be less than that of water (1,000), since it floats upon water, and as the gravity of whole milk is but 1031, it must be evident that the cream examined by Berzelius was more than three-fourths milk, and the records of Voelcker and Letheby must be based on samples of cream composed of milk to the extent of one-half or more. With such an ever-present uncertainty in the actual composition of any sample of cream, the only sure way of determining its real value is to churn it."

Creameries. — By "creamery," in the common and generally accepted meaning of the term, is meant the aggregation of large quantities of milk from many farms, thus cheapening the cost of butter, and producing an article of uniform quality. The small creamery is, in fact, only a large dairy, and managed on precisely the same business principles as the large creameries, but only on a different scale, requiring the same kind of apparatus and the same methods. The advantages which creameries afford over private dairies are becoming more and more appreciated by the public, as is evidenced by the many thousand establishments of this kind in the United States, with the number rapidly increasing, causing private dairies to be supplanted by the former all over the country. There is probably no one article of food which comprises so many grades, from the very poorest to that of the finest quality, as butter; and none of which there is so large a proportionate quantity of a poor grade manufactured as this, which is such a delicious article of diet when properly made. A reliance upon uniform quality in butter increases its value.



COOLING VAT FOR SETTING MILK.

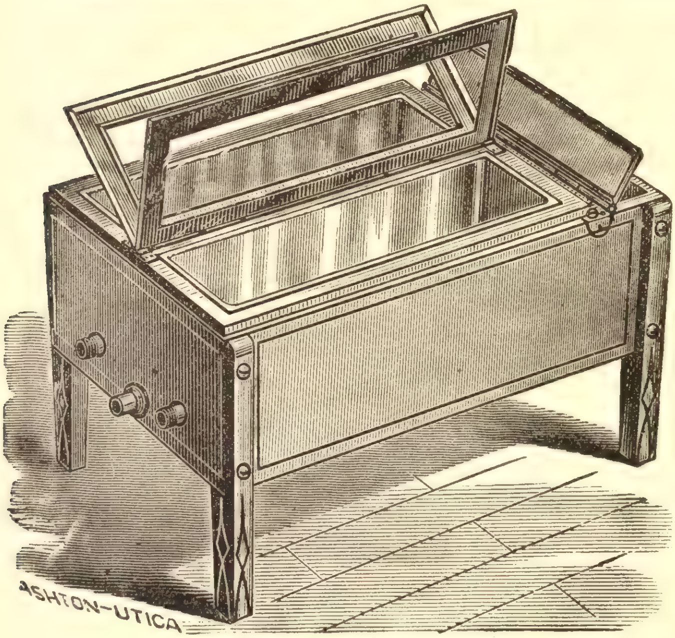
The high degree of perfection that has been attained in our first class creameries in butter making, has caused such butter to be in great demand, and to command the best price in the market. Butter making has, in fact, been reduced to a science, and experts have become so numerous that we expect to find one in every creamery, although we cannot expect to find one in every private dairy. Creameries also save much of the labor that was formerly performed in the farmer's house by his wife and daughter, relieving them of much of the drudgery that was necessarily associated with every farm dairy.

There is no reason, however, why, with a well-appointed dairy and skillful management, as high a grade of butter, or even higher, cannot be thus produced, than can be manufactured in a creamery, since a better quality of milk might be obtained from a choice herd of cows than

where a large number of dairies are massed together; besides the objections to the transportation of the milk or cream would be avoided, milk usually depreciating somewhat by transportation. But unfortunately, model private dairies are very rare, as the dairy products found in the markets everywhere clearly prove; and taking all things into consideration, there can be no possible question but that the creamery system, as at present carried on, is a great improvement upon the old method, which resulted in about as many grades of butter being put upon the market as there were dairy farms in the country, the majority of the quantity being exceedingly poor, and what might be termed "dairy grease."

The great mass of the butter of the future will doubtless be made by creameries, a fair proportion of it being now so manufactured, for over them will be exercised an intelligent supervision, directed by the improvements resulting from the experiments and labors of the specialists, who devote so much time in ascertaining the best methods of butter making, while a sufficient amount of capital necessary to the carrying out of the constant improvements in the process will by this means be employed.

Butter when produced of uniformly good quality by creameries, soon acquires a reputation, and there is a demand for it which renders its production attended with such profit as induces corporations of associated dairymen to be formed, and largely increases the number of such establishments. From the many thousands of creameries in the United States and Canada, and from the general uniformity and constantly increasing popularity of their products, it will not be surprising if in a few years in advance of the present, it will be as difficult to find a churn or a milk pan in a farm house, as it is now to find a spinning wheel or a loom. Of course the system of manufacturing will have to be arranged to meet the special conditions. A writer familiar with the creamery system of management gives the following outline of a plan for a small creamery suited to the manufacture of both butter and cheese, adapted to a hundred cows. In this plan it will be seen that arrangements are made for setting the milk, and not for collecting according to the Fairlamb system; hence, it will of course need to be modified to suit the special requirements and conditions, whether butter only be made, or both butter and cheese, it being understood that a large creamery suitable for a thousand cows can be managed much more economically in proportion, than a small one; for instance:

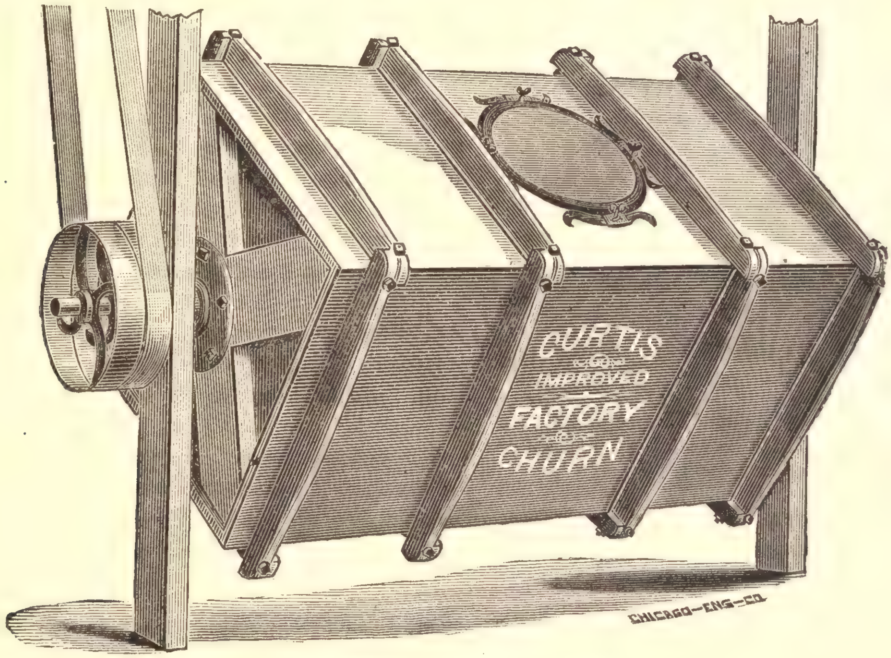


EXCELSIOR COOLING VAT.

"The owner of a butter dairy farm of 20, 30, or 50 cows must necessarily make use of all the labor-saving methods of the creamery, and it costs little more to do the work for 100 cows, and scarcely any more for apparatus, than for 50. He may as well, then, gather in the milk of his neighbors and add this to his own and work all together. In doing this it will probably be better to purchase the milk at a stated price than to take it in any other way.

Certain regulations and restrictions as to the feeding of the cows and the quality of the milk will be necessary to secure fair treatment of the dairyman, but these will be easily made as experience proves them to be necessary.

The first consideration would be the building and its arrangement, the next the furnishing of the creamery, and lastly the method of operation. The arrangement of the building will necessarily depend upon the system of setting the milk, and this will depend upon the supply of water and ice. Ice is an absolute necessity for modern dairying and for either deep or shallow setting. The deep setting requires the least room, for a pail holding 20 quarts will occupy only nine inches of horizontal space. For 100 cows 50 cans only will be required, because with cold setting the whole of the cream is raised in 12 hours, and two settings only will be required at once; 50 cans will hold 1,000 quarts, which may be expected



RECTANGULAR FACTORY CHURN.

to yield 100 quarts of cream, and in the best of the season 75 to 100 pounds of butter. These 50 cans will need but a space of 100 by 50 inches, or four refrigerators, each having a floor space of about 50 by 25 inches.

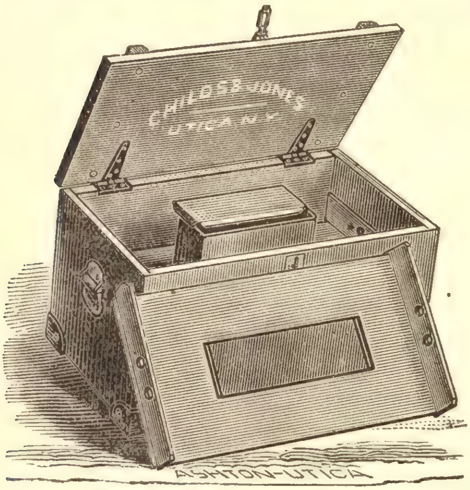
BUTTER TRIER.

There is no other system of setting milk so economical of room, cost, and labor. A building, then, of this capacity would need to have a milk-room no larger than 16 square feet; an ice-room of the same size; a churning-room and work-room 12 by 16, and a cheese-room of 24 by 16; in all, a building of about 32 by 16 feet, with an addition in the rear of 12 feet wide, and an ice-house at the end.

There should be no communication between the milk-room and the cheese-room, and the ice-room should communicate directly with the milk-room. The milk-room should be

made with double walls to preserve an even temperature and to save the consumption of ice. The floor of the milk-room should be of concrete; the house, if of wood, should be built upon an underpinning of brick or stone, 18 inches above the ground; and if the milk-room were sunk three feet below the surface it would be desirable. The floor of the churn-room and cheese-room should be of closely jointed plank, so that they could be washed off every day, and a drain should be made to carry off the waste water.

The cooling vats for setting milk, manufactured by Childs & Jones, of Utica, New York, (to whom we are indebted for permission to copy many of the cuts of improved dairy implements in this department from their catalogue), are designed for large dairies and creameries. The first represented is arranged for cooling milk by passing cold or ice water through a series of cooling pipes or coils, carrying the water first through the outer or exterior coils or pipes, and then through the inner coils or pipes, as illustrated by the diagram.



BUTTER BOX AND COOLER.

The second vat is double, with ice tank at the end. There is an arrangement of water pipes inside through which water may be run or forced, cooling the milk rapidly and causing a full yield of cream. Steam pipes are also placed underneath to be used when required. Cheese can be made in these vats also.

The butter box and cooler is designed for shipping butter to market during warm weather. When properly packed, but little ice being required, butter can be transported several hundred miles in good condition.

The rectangular factory churn, manufactured by Cornish & Curtiss, Fort Atkinson, Wisconsin, is a revolving churn with no dasher. These churns are designed for large dairies or creameries, and are made from twenty-four to thirty-six inches square, of any desired length, and to hold from sixty to five hundred gallons.

Inauguration of the Creamery System. — To Jessie Williams, a well-to-do farmer living near Rome, New York, is accorded the honor of being the originator of the creamery system. It seems that some had tried the plan before him, but were not successful in inducing others to follow their example. This gentleman was an experienced and skillful cheese maker, always obtaining the highest prices for his cheese. In 1850 his son was married, occupying a farm not far from home. Looking to his son's interest as well as his own, Mr. Williams marketed the cheese that was made on both farms; but subsequently, being in doubt as to his son's ability to make cheese of the desired quality, it was arranged that the father should make the cheese for both farms by going to his son's farm for that purpose. As this plan caused much inconvenience and loss of time, it was supplemented by carrying the milk from the son's farm to the milk-house of his father's dairy; other neighbors eventually combined in the enterprise, and thus was established the associated dairy business.

The progress was at first slow, as is usual in any new enterprise. In 1860, about thirty-eight creameries were erected; by the end of 1866, five hundred factories were in operation, the cheese factories being almost exclusively devoted to the manufacture of cheese, butter, and skimmed milk, or skimmed milk cheese. In 1872, the number of factories in New York State alone was estimated to be over one thousand, and in 1882, to be fully two thousand.

Great advancement in the dairy interest has been made in the Western States during the past few years. It is estimated that in the State of Iowa alone a hundred and fifty cheese and butter factories were erected in 1881, making at that time nearly six hundred in that State. It is estimated that over six thousand creameries and cheese factories are now in operation in the northern portion of the United States and Canada, with probably between two and three millions of cows contributing to them.

Measurement of Cream. — The general rule for cream measurement in creameries on milk when set twenty-four hours, is one hundred and thirteen cubic inches for a pound of butter.

At the sixth annual convention of the Iowa Butter and Cheese Association, held at Board of Trade Hall, in the city of Cedar Rapids, February 22, 23, and 24, 1882, Messrs. C. A. Huston, President of the Cedar Rapids Board of Trade, H. H. Markley, President of the Iowa Butter and Cheese Association, and I. H. Wanzer, of Elgin, Ills., expert in dairying (old and new process), were appointed a special committee to report on sizes of milk setting cans, and the relative depth of cream necessary to give 113 cubic inches, the quantity estimated to produce a pound of butter. The committee gave the subject their special attention, and reported to the convention the following resolution, which was read and adopted:

Resolved, That, as it requires 113 cubic inches of cream on milk when set 24 hours, and set in deep setting cans, to make 1 lb. of butter, the measurement of cream should be as follows: For cans 12 inches in diameter, 1 inch depth of cream; for cans 8 inches in diameter, 2¼ inches depth of cream; and for cans 8½ inches in diameter, 2 inches depth of cream to make a pound of butter. The milk to be set in a temperature not below 50 degrees nor above 60 degrees Fahrenheit, and not less than 24 hours before being skimmed. The standard of measurement shall be as here recited, and it is recommended that all cans be made to conform to these dimensions. This measure for cream does not in any way apply to the shallow setting system.

The Lactometer. — The use of the lactometer, when properly understood, will be found a valuable aid in protecting against fraud so often practiced in diluting and skimming milk. The following from the *National Live Stock Journal*, explaining the use of this instrument, will be found of value to dairymen, and those having charge of creameries and cheese factories.

"In our intercourse with dairymen and factory men, we frequently meet with those who omit to use the lactometer, from not having a clear conception of how its indications are made significant. Its operation, however, is quite simple when once clearly comprehended. In the first place, it should be distinctly understood that each instrument is made to be used in milk at some certain temperature, generally 80°, and the first thing to be done is to see that the milk to be tested is at the right temperature. The milk for testing is best held in a narrow glass jar, deep enough to float the instrument in it with some room to spare. The lactometer is then to be carefully put into the milk, so that it will not sink much below the number 100, which is the point to which it should settle to indicate pure milk. If the operator lets go of the stem of the lactometer much before it has settled to the pure milk point, milk is apt to adhere to the stem, and the little extra weight thus added will make it too heavy, and it will sink too low to be exact. Care should therefore be taken to keep that part of the stem which rises above the milk dry. The operator has then only to observe the point on the stem which, when it has come to rest, is at the surface of the milk, to determine whether the milk is right, or too light, or too heavy. If the line marked 100, which is also usually marked P., is at the surface, it is supposed to be right; if the stem sinks lower than P., the milk will be unusually light, and watering may be suspected, according to the depth to which it sinks. Since the stem sinks to 100 in pure milk, and in pure water to 0, usually marked W. near the

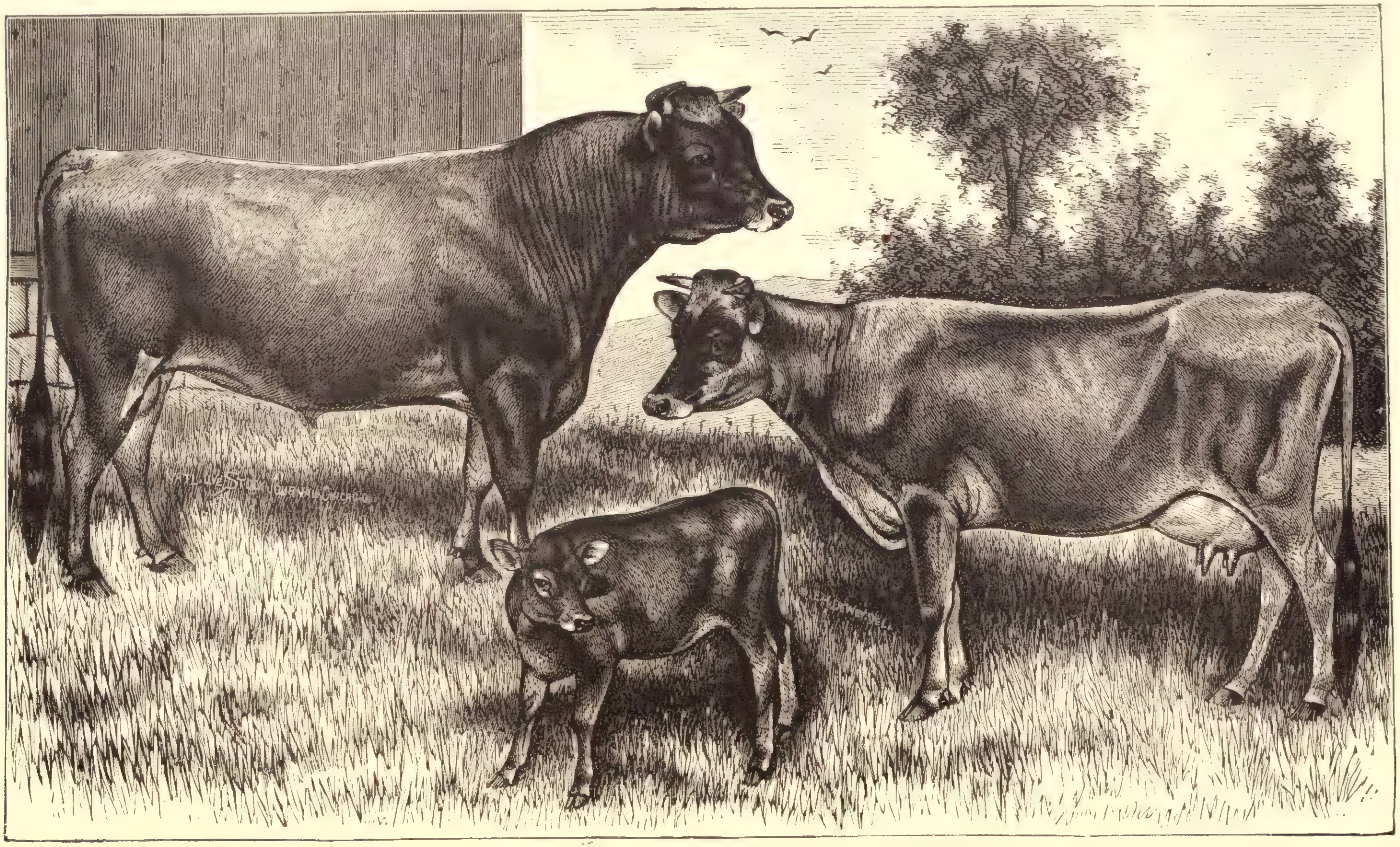
top of the stem, if milk and water are equally mixed the stem will sink to a point half-way between 0 and 100, namely, 50. If milk and 10 per cent. water are mixed it will sink to 90. If 20 per cent. of the mixture is water, it will sink to 80, and so on according to the amount of water added. If the operator has been careful to have the milk tested at the proper temperature, and he finds the lactometer sinking more than 3° or 4° below 100, he may fairly suspect water to the amount indicated has been added.

As cream is lighter than the liquid part of milk, if it, or any part of it, should be removed, it would leave the remainder, or skim milk, heavier than normal milk. When fully skimmed, it becomes heavy enough to cause the stem to rise to about 110. If half the cream has been removed it will bring the line representing 108 at the surface of the milk; removing one-fourth of the cream to 104, and so on, according as more or less of the cream has been taken off. If in testing milk the operator finds 100 rising more than 2° or 3° above the surface of the milk, he may reasonably suspect skimming has been done, according to the extent to which the stem rises out of the liquid.

The operator should keep constantly and distinctly in mind that the function of the lactometer consists solely in showing whether the sample of milk tested has the same gravity as, or is lighter or heavier than, average whole milk. Its significance arises from the fact that milk is heavier than water, and if water is added to it, it becomes lighter than it was before. When, therefore, the lactometer shows milk to be lighter than usual, it gives grounds for *suspicion* that the sample has been watered. Because skim milk is heavier than average whole milk, if the lactometer shows a sample to be heavier than whole milk, it affords grounds for *suspecting* it has been skimmed. It proves nothing, because it would have given the same showing if the milk had been made lighter or heavier than usual from any other cause than watering or skimming. Cream, as well as water, is lighter than milk, and if a sample contained more cream than average milk, it would give just the same showing by the lactometer as if water had been added to average milk.

On the other hand, since sugar or salt is heavier than milk, if either of these substances was dissolved in whole milk it would make the milk heavier than usual, and the lactometer would rise in it just the same as if it had been skimmed. Though the lactometer is a very sensitive instrument, and discriminates with great exactness between the gravities of samples of milk, it is a blind guide, and, like all blind parties, is easily cheated and liable to go astray, and its testimony should not be implicitly taken without corroborating evidence. Should it show milk to be very much lighter than usual, watering would be very evident, and the lactometer, like a blood-hound, would bay on the track of the rogue, but it would not convict him, because it could not testify as to the cause of the unusual levity, it could only testify it was too light, from which fact *inferences* might follow. The same uncertainty would exist if milk was found too heavy. It might be skimming, or it might be something else that made it so.

The creamometer, cream-gauge, or cream-tube, as it is variously called, should always be used in connection with the lactometer. It consists of a graduated glass jar for showing the percentage of cream which rises on the milk within it. If the percentage of cream which rises on a sample of milk diminishes at the same rate its gravity decreases, as shown by the lactometer, dilution becomes evident enough to convict. If the percentage of cream was greater than usual, it would show that the sample was light from unusual richness in cream. So when milk tests heavier than usual, if the cream diminishes as the gravity increases, skimming would be proved, but if the usual percentage of cream appeared in the creamometer, it would be considered certain that the unusual gravity was from some other cause than skimming. It is not safe to dispense with the use of the cream test, even when the lactometer indicates pure milk, because it may be so easily cheated. The rogue who knows that skimming milk makes it heavy and watering makes it light, may, after skimming, water



JERSEYS, "ONE TON" and "MORA."

Property of Churchman & Jackson, "Beech Grove Farm," Indianapolis, Ind.

his milk enough to make it just as heavy as whole milk should be. The indications of the lactometer would show such milk to be pure, though it was both skimmed and watered, but an appeal to the cream-guage would detect the whole fraud.

The indications of the lactometer are often objected to because the milk of individual cows show wide variations in specific gravity when tested with that instrument. There would be a good deal of force in these objections if the tests were confined to the milk of single cows, for it is well known that there are cases in which the tests have shown deep skimming and as high as 16 per cent. dilution in milk as it came from healthy grass-fed cows. The utility of the lactometer in connection with the cream gauge is based upon the equally well known fact that, in the milk of a herd of any considerable number of cows, the individual differences are equalized, and the gravity of the average is very uniform. It is rare indeed for the collective milk of even a half dozen cows to vary more than .02 of the difference in weight between milk and water, except when some very unusual feed or treatment is present to account for a wider change. In view of this acknowledged uniformity in the milk of herds, and the fact that it is upon the milk of herds only that there is occasion to employ it, its use in the hands of the factory men and milk experts is regarded as a valuable aid in protecting against frauds in both dilution and skimming, and should be in frequent use in every cheese factory and creamery."

Cheese Making. — Cheese is a solidified preparation from milk, the essential constituent of which is casein, besides which all cheese contains some preparation of fat or butter, and in the more rich and choice varieties this often exceeds the casein in amount Cheese may be made from the milk of different animals, that of the cow being principally employed; it is, however, made to a certain extent in some countries from the milk of the goat and ewe. The richness and flavor of the cheese, as with butter, will vary with the animal, the breed, the feed, and many other attending circumstances; the object in cheese making being to obtain, in a solid form, as large a proportion of the casein and butter in the milk used as possible. If, after the cheese is made, the residuum of whey remaining shows a lack of casein and fat or butter, the manufacturer may be assured that he has succeeded in extracting, by the process, these elements from the milk. The average composition of whey drained from cheese is estimated as follows: Water, 92.95 per cent.; butter, .24; casein, .81; milk, sugar, and lactic acid, 5.27; and mineral matters, .73 per cent. Cheese, as an article of food, is highly nutritious, being rich in bone and flesh-forming material; it also contains fat and heat-producing properties.

Cheese also extracts more from milk than butter, and consequently better economizes the use of milk, the average quantity produced being, as estimated by Prof. X. A. Willard, about ten pounds of cheese to a hundred pounds of milk; and the average butter yield, with common cows, one pound of butter to twenty-five pounds of milk. The amount of milk manufactured into cheese in this country, in comparison with what is made into butter, is estimated by reliable authority as being one pound of milk made into cheese for eight pounds made into butter. There is a large amount of cheese of poor quality thrown upon the market, such a product being a very imperfect food, and actually unhealthy for many; while cheese of a good quality, properly manufactured, is a healthy article of diet and a more valuable food than butter, butter being composed of only heat and fat-producing matter, with but a slight amount of material for building up or sustaining the animal frame-work and tissues.

The great bulk of cheese made in this country is made too dry and hard to be palatable, and too sour and indigestible to be healthful. It is doubtless owing to the lack of skill in the art of manufacturing cheese that so small an amount is made in this country, in comparison with butter. If this important branch of dairy industry is to be conducted on an extensive scale, we believe it to be for the farmer's interest to patronize a cheese factory, if

practicable, thus securing a uniform product of a better quality, as well as a larger amount than would be produced from the same quantity of milk in the dairy, as the latter is commonly managed. The same essential advantages are to be derived in the manufacture of cheese by patronizing the cheese factory as from the creameries in the making of butter, the factory product being usually of good, uniform quality, better flavored, commanding a higher price in the market, while a larger quantity of cheese can also be made from the same amount of milk than can be obtained in the farm dairy. The labor of cheese making is all obviated in the farmer's home by this system, an item of no small importance to the farmer's wife and daughters, who have much of the heavy work of the dairy to perform upon the farm. If there is no cheese factory in the vicinity at a convenient distance to make its patronage profitable, it would be a good plan for the farmers to unite in establishing one, which, under proper supervision and skillful management, would prove a profitable investment.

Varieties of Cheese. — The different kinds of cheese that are produced on the farm are made from the whole milk, or that which is new and has not been skimmed; that from a mixture of one-half new milk, while the other half has stood twelve hours and had the cream skimmed off that has raised during that time; and that from which all, or nearly all, the cream has been removed, commonly known as skimmed-milk cheese. Of these different kinds, of course the first, when properly made, is the best, being rich and of fine flavor. The second is considerably less rich than the first, and of medium quality. The third is generally of poor quality, being devoid of cream, and consequently of the butter element, and is usually hard and indigestible.

English cheese is divided into three classes: (1) that which is made from whole milk, with an addition of cream; (2) that made from whole milk; and (3) that made from skimmed milk. The far-famed Stilton and Double Gloucester cheese belong to the first class mentioned, being made of morning's milk, to which the cream of the previous evening's milk has been added.

The different kinds of whole-milk English cheese are known as Single Gloucester, Cheshire, Cheddar, and Dunlop.

The third class, or skimmed-milk cheese, is of the lowest grade of the English product, and is the cheese commonly used by the laboring classes. Besides those already mentioned, there are other varieties more or less common, among which is the Neufchatel, or cream cheese, which is made of pure cream, and the Gargonzola, an Italian variety. The former will not keep well, and must therefore be eaten while it is fresh, or soon after being made; the latter is quite rich, and similar to the Stilton. The quality of the different kinds of cheese depends much upon the mode of manufacture and other circumstances, besides the proportion of butter they contain. An English writer of prominence says with respect to the imported American cheese: "Of foreign cheese imported into Great Britain, the most important in point of quality and value is the American; and, since the introduction of the factory system of cheese making in the United States, this has greatly improved in quality, and become an important and extensive article of commerce." This is certainly important testimony from English sources.

Of course the milk of different breeds and herds of cows will differ in quality, some milk being much richer in both the butter and casein elements than others; but we believe the different qualities of cheese found in the market are due more to the skill, or lack of it, of the manufacturer than in the quality of the milk used. We have eaten skimmed-milk cheese in which that skill was employed in its making, that brought out and utilized the fullest excellence of the material used to such a degree that it was in quality greatly superior to whole-milk cheese manufactured by inferior skill. Much depends upon the quality of rennet used for curdling the milk, the pure, chemically-prepared extract of rennet being the

best. The milk and curds should also be worked sweet, souring to be avoided. The prolonged aeration of the warm curds before pressing likewise adds to the richness of the cheese.

The following table, compiled from various reliable sources, shows the average composition of the principal kinds of cheese known to commerce:

ANALYSES OF DIFFERENT KINDS OF CHEESE.

	Water.	Casein.	Fat.	Milk, sugar, etc.	Ash and common salt.
Stilton,	20.27	33.45	43.98	....	2.20
Cheshire,	32.59	26.06	32.51	4.53	4.31
Cheddar,	30.32	28.18	35.53	1.66	4.31
Double Gloucester,	33.41	27.75	32.69	2.23	3.92
Single Gloucester,	36.50	25.75	28.75	4.68	4.32
Wiltshire,	39.22	34.22	19.26	2.28	5.02
Dunlop,	38.46	25.87	31.86	....	8.81
Ordinary skim-milk,	39.43	30.37	27.08	0.22	2.90
American,	27.29	25.87	35.41	6.21	5.22
Dutch (Gonda),	36.10	29.43	57.54	6.94	....
Camembert,	51.94	18.90	21.05	4.40	4.71
Parmesan,	27.56	44.08	15.95	6.69	5.72
Gruyere,	40.00	31.50	24.00	1.5	3.00
Brie,	45.25	18.48	25.73	4.94	5.61
Roquefort,	34.55	26.52	30.14	3.72	5.67
Neufchatel (cream cheese),	36.58	8.00	40.71	15.80	0.51

Stilton Cheese.—This is a rich, fine-flavored cheese, much prized in England, as well as other countries. It was formerly made by adding an extra amount of sweet cream taken from the previous night's milk to the morning's milk; but it seems that a new method of its manufacture has, within a few years, been adopted, as will be seen by the following from Prof. Willard, to whom previous reference has been made:

"Among the small cheeses of great renown, and universally esteemed both at home and abroad, is the Stilton. That it has not been more extensively produced in America has been owing to a lack of knowledge as to its manufacture, and a supposed difficulty in adapting its manufacture to our factory system.

Stilton is a rich, meaty cheese, and as originally made required an extra measure of cream, obtained by robbing the night's mess of milk of its cream to enrich the morning's milk, which was then converted into Stilton. Upon this plan the night's milk, robbed of its cream, was left to be turned into skimmed cheese, thus necessitating the manufacture of two kinds of cheese from day to day; one of which, being inferior to the whole-milk variety, must be sold at a less price. This loss could only be met by a very high rate on the Stilton to compensate for the making, and especially as the trouble and expense of manufacture were also enhanced over that of the common sorts.

What was needed in the production of Stilton was that its manufacture be adapted to our factory system; and again, that the profits in making be ample, or sufficiently above those obtained from making the usual style of factory cheese, and at the same time to place Stilton before consumers at a price low enough to send it into general consumption.

This, it seems, has been accomplished by the somewhat recent modification of methods for producing Stilton in Leicestershire, England, and which I think may be turned to good account on this side of the Atlantic.

The plan of making modern Stilton, if I may so name it, is that adopted by Mr. Thomas Nuttall of Leicestershire, for the description of which I am indebted to the excellent report of Mr. George Gibbons, one of the judges on cheese-making at the late exhibition of the

Royal Agricultural Society. As to the quality of Mr. Nuttall's Stiltons, the numerous prizes, gold cups and medals, received at many fairs and dairy shows, attest their excellence. In 1879, Mr. Nuttall was awarded first premium for Stilton at the International Dairy Fair in New York, and also the first and second champion prizes at the dairy show held in Birmingham in 1881.

The new process discards the idea that Stilton cheese can only be made by the addition of extra cream, or that cream must be taken from the evening's milk and mixed with the new milk of the morning, thus necessitating the making of a large quantity of skim cheese, unless the skimmed milk can be otherwise disposed of. No extra cream is used in its manufacture. The cheese is made from new milk fresh from the cows twice a day, morning and evening, by the most simple and natural process possible.

Without going into all the details of manufacture, as practiced in Leicestershire, I shall only allude to some of the leading points in the process as adapted to our factory system.

The cheese vat is similar to our factory vats—that is an outer vat of wood lined with tin, and space between the two for water, and holding about 600 gallons. The milk is set (with rennet) at a temperature of 79° Fah., and a sufficient quantity of rennet is added to perfect coagulation in from $1\frac{1}{2}$ to $1\frac{3}{4}$ hours. The rennet should be thoroughly mixed through the milk. The coagulation having been perfected, four persons take their places—two on each side of the vat—and with small tin bowls, commence removing the mass of curd into cloths, which are placed in tin vessels called drainers. These drainers are six feet long, two feet wide, and six inches deep.

Iron rods are fastened across the drainers at intervals of 18 inches, on which the sides of the cloth are placed. The drainers are also provided with faucets for drawing off the whey. Two of these drainers are fixed on a frame, two feet apart, one above the other, standing on wheels for easy removal. As soon as these are filled, they are placed on one side of the dairy room, and others take their place. Thus, in the space of about twenty-five minutes, all the curd is taken from the vat, which is at once carefully cleaned. The cloths containing the curd are loosely tied by the four corners, thus allowing the whey to partially separate from it. But it is considered essential that it does not drain off, the old saying on this point of manufacture being 'that it should wallow in its own whey.'

In about an hour the faucets are turned and the whey is allowed to drain off, when the cloths, after being tightened, are placed close together in a larger drainer, similar in dimensions to the cheese vat. Here they remain 12 hours, when the whey, which by this time has considerably further separated, is allowed to escape; the cloths are again tightened, and the curd having now obtained a considerable amount of consistency is placed in other coolers.

The curd is in a little time removed from the cloths and cut into pieces. After remaining in this state 12 to 24 hours, it is coarsely ground and the morning's and evening's curds are well mixed, with $6\frac{1}{4}$ ounces of finest cheese salt to every 24 pounds of curd.

It is then put into tin hoops perforated at the sides, and 12 inches deep by 18 inches in diameter. These when filled are placed in a room with a brick floor fitted with shelving, and heated to a temperature of 65° Fah. This causes the whey to exude rapidly, gradually ceasing at the expiration of five or six days. The cheeses are then removed from the hoop and taken into the binding-room where they are smoothed with a knife and bandaged by strong cotton cloth being pinned around them. This smoothing is repeated daily, and dry bandages applied, until the cheeses get firm and partially coated, which generally takes place in about 12 days.

They are then removed to the drying rooms, which are also kept at a temperature of 65° Fah. by means of steam pipes, or cooled by water trickling over the slates from a perforated pipe. The cheese is considered fit for sale at about six months old, when the 24 pounds of

curd placed in the hoop will have produced a cheese of some 12 pounds weight. Thus it will be seen the cheese in this process may be said to almost make itself. There is no waste of butter in the breaking, there is no pressure applied, and it is scarcely touched with the hands. A fine, rich, creamy product is the result, which, with its deep blue veins, commands the highest price of any cheese made in Britain.

It may be remarked in this connection that the lovers of Stilton require the cheese to be streaked with veins of blue mould; hence the necessity of giving it some age before placing it on the market. To a large number of consumers the blue veins are not considered essential, and for such the cheese would be sooner ready for consumption, and from its mild, delicate flavor, and rich, stocky texture always commands a ready sale, at *extreme rates*.

The plan of making, here described, is adapted to American factories, and I believe could be entered upon in a limited way with success, the product being employed both for home use and for export."

Cheshire Cheese.—In making this cheese the evening's milk is set during the night and skimmed in the morning. The skimmed cream, with a portion of the milk, is then heated up to 130° F., a sufficient quantity being thus heated to raise the whole of the evening's and morning's milk together to about 90°. About twelve square inches of rennet is placed in a pint of salt water and soaked about twenty-four hours previous to making the cheese, this quantity being sufficient for a hundred gallons of milk. The curd is set from forty to fifty minutes; it is then cut very slowly, the whey being syphoned or pumped out as soon as possible. Before the whey is all removed, however, a portion of it is heated and returned to the vat, where it is left for half an hour, the whey being afterwards drained off, and the curd left to get firm. The test of its firmness is when a cube of about a pound weight will stand on the hand and not break. It is then drained off by being placed upon a drainer made with a false bottom of rods, and left for forty-five minutes, after which it is broken up and salted, in the proportion of from three and a half to four and a half pounds per hundred weight of curd.

A light weight is then placed upon it for about three-quarters of an hour, during which time it is turned over once or twice, and cut into squares. It is then passed through the curd mill, and afterwards put into the vat, a cloth being first pressed into place by a tin hoop, and the curd placed carefully in it. After being in the hoop in this manner with a slight weight upon it for one or two hours, according to the weather, it is turned over and put into a kind of oven or warm chamber in or near the brickwork of the dairy chimney, where it remains during the night at a temperature of 90° to 100°. In the morning it is turned upside down in a fresh cloth and pressed three days, being turned twice a day, and the cloth around it changed at each turning. Cheese made in this way requires from five to seven days for drying, but afterwards matures more quickly than that made by some other methods.

Cheddar Cheese.—The Cheddar cheese is regarded by the native Englishmen as the best cheese in the world. American dairymen have not yet been able to surpass in excellence the fine specimens of the English product. The chief characteristics of this cheese may be regarded as mildness and purity of flavor; mellowness and richness; long keeping qualities, and solidity. An English manufacturer of Cheddar cheese describes the process as follows:

The morning's and evening's milk are together brought to a temperature of 80 degrees Fahr. If the night has been warm, a temperature of 78 degrees will give as great effectiveness to a given quantity of rennet as one of 82 or 84 degrees would give if the milk had been at a lower temperature for some hours on a cold night. The evening's milk having been placed in shallow vessels during the night to cool, and having been stirred at intervals during the evening, is skimmed in the morning, and the cream, with a portion of the milk, is heated up to a hundred degrees by floating it in tin vessels on the boiler. The whole of it

is then poured through a proper sieve into the tub—into which the morning's milk is being also stirred as it arrives—so as to raise the whole, as I have said, to from 78 to 82 degrees Fahr. This tub may be a large tin vessel, capable of holding 150 gallons, and provided with false bottom and sides, enabling hot or cold water to be passed under and around its contents.

The rennet, made from two or three dozen vells, in as many quarts of salt water, and allowed to stand three weeks, is added—half a pint to 100 gallons—and the curd sets in about half an hour. The small vells (rennets) of calves, which are killed at about a week old, are preferred, and they should be eighteen months old before use. The curd is slowly cut with a single long blade to and fro throughout its depth, in lines forming a 4-inch mesh upon the surface, and the whole mass is gently turned over from the bottom with a skimming dish in the hand.

The whole is then again worked throughout with a "shovel-breaker," a four-fingered paddle with wires across the fingers—great care being taken to do it gently, so that the whey shall not become too white. The curd is thus broken up into pieces not much larger than peas, and at least half an hour is taken in the process. Hot water is then let into the space around and below the cheese tub, and the whole is raised to 100 deg. Fahr.; and this, too, is done gradually, so as to raise the whole by degrees, not heating any portion to excess. This also takes half an hour. The hot water is then drawn off, and the curd is stirred by the hand and a skimming dish for another half hour in the midst of its hot whey, being at last reduced to a mass of separate bits the size of small peas. The whey, after settling for half an hour, is then removed—ladled, syphoned, or drawn—to its vat, where it stands about six inches deep, and is skimmed next day, yielding a butter which should not exceed in quantity six to eight ounces per cow per week.

The curd stands half an hour after the whey is drawn off, and it is then cut in four or five pieces, turned over and left for half an hour, after which it is again cut and left for a quarter of an hour. After this, it should be in the slightest degree acid to the taste. If allowed to become too acid, it will not press into a solid, well-shaped cheese, but will be apt to sink broad and be misshapen. It is now torn into pieces by hand and left to cool; and thereafter it is packed in successive thin layers in the vat—a cylindrical or wooden vessel twelve inches or more wide and twelve inches deep—whence, after being pressed for half an hour, it is taken out (it is then probably midday), and broken up by hand, and allowed again to cool. Then, when cool, hard, sour, dry, and tough enough (all this, of course, being left to the judgment of the maker), it is ground up in the curd mill; two pounds of salt are added to the cwt. of curd, and the whole is allowed to cool, and as soon as cold, it is put in the vat and taken to press. It is then probably 3 P. M. The pressure on the cheese may be 18 cwt. The cloth is changed next morning.

A calico coating is laced on it the second day, and the third day the cheese may be taken from the press, placed in the cheese room, bandaged, and turned daily, afterwards less frequently. The cheese room should be kept at nearly 65 degrees Fahr. The cheese will not be ready for sale for three months. The process of making Cheddar cheese lasts all day, and the cheeses are made of various sizes, generally twelve inches wide and a foot high, but sometimes larger in both dimensions, and from 70 to 100 pounds in weight; the object being to make all the milk of one day on a farm of thirty to forty cows into a single cheese.

Single Gloucester Cheese.—There is no heating process in the making of this cheese, the rennet being added to the milk as soon as it is deposited in the tub or vat. As soon as the curd is set, it is broken up with a wire breaker, by moving it up and down, which has a tendency to make it into a kind of pulp. The mass is then left to settle and attain a proper degree of firmness, when the whey is dipped off; the curd is then cut across and put to press. It is taken out of press in the morning, turned, and salted on the outside. It is returned to the press, and taken out and treated in the same manner for five or six successive

days. After being taken from the press, it is put upon a shelf and turned every day, and after curing in the cheese room for two or three months, it is ready for market. The Double Gloucester cheese is made by the addition of cream to the milk.

Gorgonzola Cheese.—This is an Italian variety of cheese that is imported into England to a considerable extent, and is highly esteemed there by the wealthy consumers, being considered by many as equal to the Stilton variety. Willard says, respecting this kind of cheese:

"At the International Dairy Fair in New York a few years ago, samples of Italian Gorgonzola were shown, and they were examined with much attention by many of our dairymen at the exhibition, and the question was then frequently asked whether this variety could not be successfully imitated in this country. I have heard, however, of no attempts having been made in this direction, though I am told the cheese is imported and may be found occasionally in New York and other of our chief cities in small quantity, and that it sells for a very high price—from twenty-five to thirty cents per pound, and sometimes more. The cheese has obtained prizes at London, Paris, and Florence, and its excellence has been in part attributed to the healthy and aromatic plants upon which the cows feed. Good sweet grasses, grown upon soils and in locations where they can mature in perfection, have undoubtedly an important influence in promoting the flavor and richness of cheese, in distinction from grasses grown on low, wet grounds, or where there is a surplus of moisture to cause it to be watery, immature, or furnishing feed that farmers usually designate as "sour."

Some of the leading features in making Gorgonzola appear to be the mode of expelling the whey from the curds; the mingling together of the warm and cold curds; the manner of applying salt, and the curing of the cheese.

The curds are made twice a day from warm milk, soon after it is drawn from the cow, good sweet rennet being employed for coagulation, and a sufficient quantity used to perfect that operation in from ten to fifteen minutes. The curd is then broken up and left alone until it has settled to the bottom of the vat, when it is still more divided up with a wooden instrument, always drawn in one direction.

The whey having separated, the curd is hung up in hempen bags to drain. The cold curds of the evening are mingled with the warm curds of the next morning's mess of milk, being placed in flexible wooden bands covered on their inside with hemp cloth, and placed on an inclined board, strewn with rye chaff. In mingling the two curds together, care is taken that the upper and lower sides of the cheese are formed of warm curds, so as to insure a good rind—the cold and warm curds, if mingled for the outside, not properly uniting. With this exception, the two curds forming the cheese are mingled in layers, the warm and cold alternating. The curds, thus mingled, are further drained during the first day of the process by two or three turnings. On the following day, the cheese having obtained some consistency, the cloth is removed and the cheese weighed. After three or four days, fermentation begins, and the wooden bands are removed. It is then salted on its upper and lower sides once a day alternately for eight or ten days, four ounces of pulverized salt being used on an average for thirty-five pounds of cheese. Some manufacturers adopt the plan of frequently turning and pressing the cheese against a salt-covered surface, thus insuring more uniformity and a better rind.

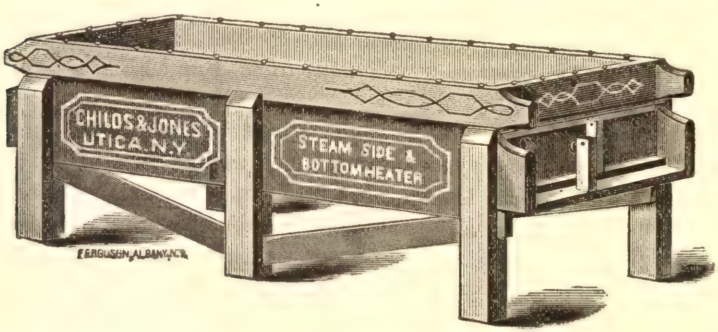
The color changes in a month to a pinkish white, if good, and if bad, to a black. When black, the rind is soft, and the cheese perishable in summer. If the crust is sufficiently hard, the shade is improved by one or two dippings in salt water. The cheese is cured in a room kept at a temperature of about 65°. They are placed on tables thinly covered with straw, at first; afterwards they are kept in a cellar for six or eight weeks, and during that time they are repeatedly turned, wiped, and salted. It takes about 100 quarts of milk to make twenty-five pounds of cured cheese, or cheese fit for market.

The cheeses vary in size from twenty to forty pounds and upward. When ripe, the blue mould has developed similar to the condition of Stilton when esteemed in its best state. Indeed, its consistency resembles a fine specimen of rich and ripe old Stilton. I have no doubt the Gorgonzola can be successfully imitated in America, as Swiss, Limburger, and other foreign varieties are now manufactured here of as fine quality as that which is made abroad."

Schalzieger Cheese.—This celebrated cheese of Switzerland is made from skimmed milk cheese, which, when it is several months old, is ground up fine and mixed with one-twentieth of its weight of the powdered leaves of the melilot trefoil (*Trifolium melilotus cerulea*), and one-tenth of its weight of fine salt, to which is added oil or butter, working the compound into a paste, which is pressed and dried, when it is ready for market. Garden sage is frequently used by the dairymen of this country in making a variety of green cheese, commonly known as sage cheese, for home consumption, but not to any extent for exportation.

Buttermilk Cheese.—This is an article little used except when eaten fresh, when it is a very palatable food. The quality of this cheese will depend principally upon the quantity of butter and casein which the buttermilk contains. Several different grades of this cheese are frequently obtained by mixing more or less of sweet milk with the buttermilk before it is heated, the acid of the buttermilk causing the coagulation of the sweet milk, which causes it to mix with the former, thus improving the quality of the cheese in proportion to the amount of sweet milk added. This kind of cheese is sometimes found in some city markets, put up in small packages of tin foil, and is of a soft, creamy nature.

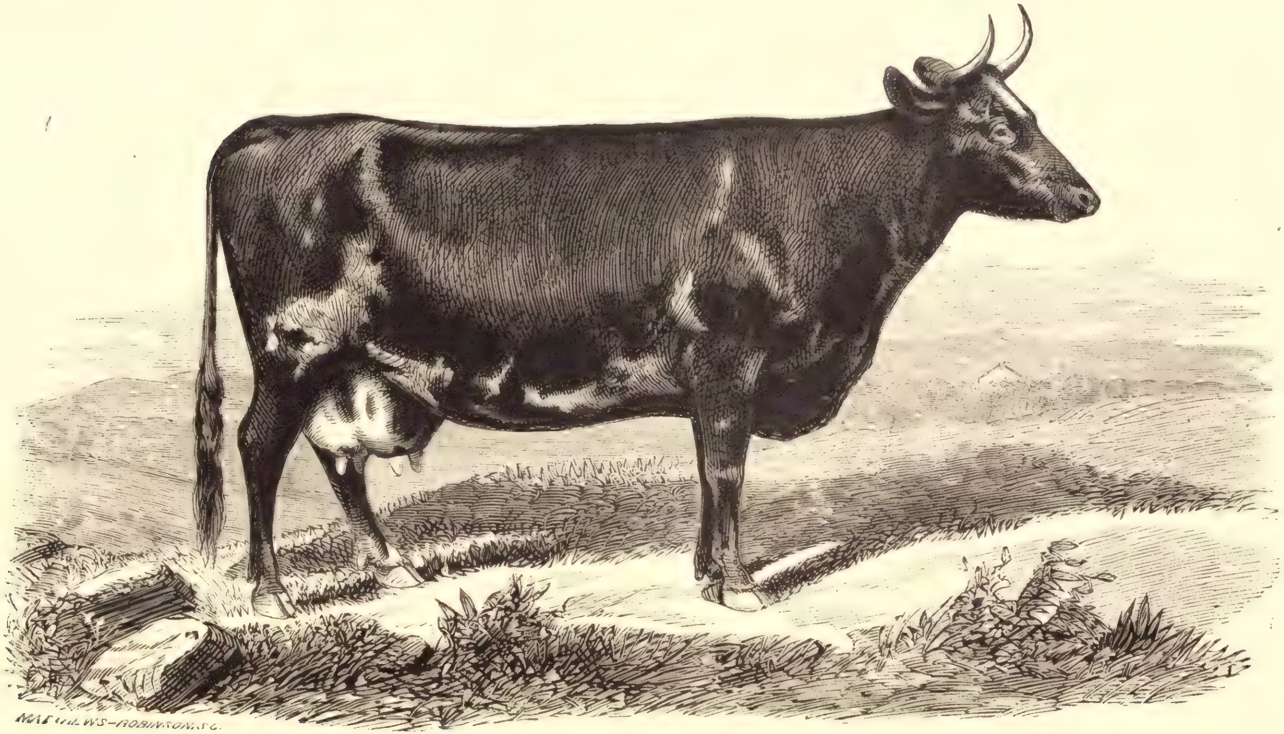
Proper Temperature of Curd.—The exact temperature to which the milk should be heated for cheese before the rennet is added, depends upon the kind of cheese that is to be made, a lower temperature being desirable, such as 72° to 75° for instance, when a thin cheese is made, while for thick cheese, such as Cheddar, it should vary from 80° to 84°; 80° being generally considered best adapted to warm weather, and a little increase being desirable in cold weather. Great care should be taken in warming the milk, not to overheat, or to allow it to burn at the bottom, as it would be liable to do where steam is not employed for heating. The slightest carelessness in this respect would greatly injure the flavor of the cheese.



STEAM CHEESE VAT.

After a portion of the whey has been separated from the curd, most dairymen scald it sufficient to raise the temperature of the entire contents of the cheese vat to about 95°, but never above 100°. Much injury is frequently done the cheese by overheating in the making.

Mr. Alexander McAdam of the Smith Creek factory says: "In making cheese early in the spring, we make from milk, three messes of which are skimmed and one new; when skimmed, the milk is put in a place where the temperature is adapted for cream raising. Set at eighty, and coagulated sufficiently to cut in thirty minutes, it begins to thicken in fifteen minutes. We use extra rennet for skim milk cheese, and heat slowly to 88°. Sometimes in cold weather the milk is very sweet, and it may lie five or six hours in the whey. We mean to keep the temperature at about 88°.



AYRSHIRE COW, "FLORA."

Owned by William Birnie, Springfield, Mass.

When the weather becomes warmer we use the milk with one mess skimmed, and then the temperature would be at 82° and heat up to 92°, keeping to this temperature. The milk would require thirty-five minutes to coagulate. We are accustomed to have coagulation occur sooner than some factories, as some let it run an hour, or even an hour and ten minutes. By scalding as low as 88°, the curd keeps soft and the acid is developed before the curd becomes solid. We use more rennet, less salt, and less heat when making skim-milk cheese, than without skimming the milk. The salt is applied upon the slightest appearance of the acid. We use it at the rate of one and one-half pounds of salt to the thousand pounds of milk. The appearance of the cheese after coming from the press must be the guide to the temperature, and according to the appearance of the cheese is determined the place upon the shelves. The curd should be put to press as soon as convenient after grinding, and before it gets too cool to face well.

If it failed to face, we used hot water and hot cloths under the follower and hot water upon the press board. If too much rennet was used, the curd would be rather slimy, and it would not unite as well, but if the rennet was sweet, the taste would not be affected. If too much rennet was used, some of the excess would be held at least mechanically in the curd, and would appear in the color.

We use with all new milk in spring manufacture a temperature of 88°, heating to 94°, and in curing we would not use over 65° in the dry-house—such a handling would produce a fine-flavored cheese. The action of heat facilitates the action of the rennet. We would use more heat after applying the rennet. As a general thing we do not think 2° or 3° in temperature would make a great difference in the price of the cheese when made. We think time would modify the slight excess of temperature. We would heat whole milk up to 96° in the summer time."

Use of Thermometers in Cheese-Making.—Thermometers should always be used in testing the temperature of milk when set, that is, when the rennet is put in. It is too often the case that they are entirely ignored in the dairy. Dr. Voelcker says with reference to this subject:

"It is really amusing to see the animosity with which some people look upon the thermometer. It is true that there are not many dairies in which it may not be found; but if we took pains to ascertain in how many of these it is in constant use, I believe that the proportion would not exceed five per cent. This is a great pity, for a tolerably good one can now be bought or replaced at a trifling cost.

Some years ago I gave a lecture on cheese-making to a number of farmers' wives and dairywomen on the estates of the late Lord Fitzhardinge. At the close of my remarks I invited discussion, and after a little while a lady got up and said, 'Well, doctor, what you have to tell us is all very well, but can you make cheese?' 'Yes, I think I can,' I answered; 'but at any rate I will try, if I have a fair chance, and see the thing done from beginning to end. The produce of a great many cheese dairies is spoilt by the cows being milked with dirty hands and so forth.' 'Very well,' said she, 'if you will come I will send for you.' I was then residing in the neighborhood. A date was agreed upon, and at half-past five, on a cold morning, she sent her trap and I drove five miles to see the cows milked. When the rennet was about to be put in I asked her whether the temperature was right. So she dipped in her hands and said, 'Yes, I think that will do.' On inserting the thermometer, however, I found it was just 10° lower than it ought to be.

At this her husband, a smock-frocked farmer who was standing by, said, 'Ah! Sally, I tell you, you have spoiled many a cheese for me by feeling the milk with your hands instead of testing it with the instrument.' Well, at last a large cheese was made and marked, and when sold it brought more money than she had been in the habit of getting. After this nearly all the farmers in the neighborhood presented their wives with a thermometer apiece.

With frankness I express my regret that the use of the thermometer is not more general, as I believe it is indispensable for obtaining a uniformly good product.

If the temperature of the milk when the rennet is added, is too low, the curd remains too soft, and much difficulty is experienced in separating the whey. If, on the other hand, the temperature is too high, the separation is easily effected, but the curd becomes hard and dry. The amount of water which is left in the curd when it is ready to go to the cheese-press, to some extent indicates whether a proper temperature has been employed. When this has been too low, the curd will contain more than fifty-five per cent. of moisture; when too high, sometimes less than thirty six per cent."

Preparation of Rennet.—Rennet is a preparation of the stomach of young grass-eating animals, it being made use of for cheese-making while the animal is young, and before it has taken any nourishment except the milk of the dam. The stomachs of young pigs are occasionally used for this purpose, but those of calves from three to six weeks old are considered the best. Rennets should only be taken from healthy calves, and such as have been well fed from the time of birth to that of slaughtering. There is a great difference in the strength of rennets; those from calves that are delicate eaters will be weak, while strong, vigorous calves will furnish rennets that are strong and effective. They should never be taken from a calf until the excrement shows the animal to be in a perfectly healthy condition. Good rennets may easily be spoiled by being improperly saved or prepared.

It is often the case that where rennets are salted down, a single tainted one in the brine will spoil the entire lot. When a pure article can be obtained, the liquid chemical preparation is most convenient for use, but it frequently happens that dairymen prefer to prepare their own rennets. The best time for killing the calf is from twelve to eighteen hours after taking a moderate meal, at which time the stomach will be nearly empty. On slaughtering the animal, the contents of the stomach should be carefully removed. The best part of the rennet is contained in a soft, delicate coating of a pulpy character, which covers the interior of the stomach. This may be very easily rubbed or washed off; it should therefore be handled with care, all rubbing or washing to be avoided.

If after trimming and turning it inside out there be anything that should be removed, it should be wiped off very carefully, avoiding, if possible, anything that shall deteriorate the strength or quality. After being moderately salted, it is sometimes blown up like a bladder; but the usual method is to stretch them out on a forked stick in a dry atmosphere, the temperature not exceeding 100° F. If heated above this temperature the strength of the rennet is weakened. It has been found that when heated to 160° the strength is entirely destroyed, especially when damp. Rennets should never be permitted to gather dampness, as the strength will by this means deteriorate. Rennets will be all the better after drying, if left exposed to the air for a year before using, as by this treatment the strong animal odor peculiar to the fresh rennet will be nearly removed, and they will also yield more strength than when new, or not dried. It is not a good practice to preserve them in brine, as is sometimes done, as by this means all the objectionable odors of the green stomach are retained and affect the cheese, while they possess less strength than when dried. When rennets are properly prepared and dried, they will have no unpleasant odor, and will be of a clear, white color. Never use those that are dark in color, or are not sweet in smell.

To prepare rennets for use, they should be soaked in weak brine, in the proportion of one rennet to three or four quarts of water. Whey for soaking them was formerly used quite extensively, and at present to a certain extent, but there are serious objections to this method, the best cheese manufacturers of the present time preferring weak brine. The editor of *The National Live Stock Journal* gives the following valuable directions for preparing rennet:

"Having selected the rennets to be used, their strength will be most readily and completely obtained by soaking them in a weak brine. A strong brine is generally employed,

but it is objectionable for the reason that it contracts the tissues in the membranes of the stomach, and thus prevents the ready escape of its strength. A brine containing about five per cent. of salt — or, say, a pint of salt to a pailful of water — will soak out the strength quicker and more completely than either a strong brine or pure water. Brine, however strong, does no injury to the active agency in rennet. It may be salted to saturation, and in excess of saturation, without impairing its power in the least. The only objection to making the brine too strong is, that it hinders the separation of the rennet's strength; therefore, soak in a weak brine first — a pint of salt to about twelve quarts of water — and, after the strength is out, throw away the rennet skins, and put into the liquid all the salt it will dissolve, and a little in excess, in order to secure its keeping.

When soaking in weak brine in warm weather, the rennets will soon taint and spoil if kept soaking too long. To prevent this, soak in a small amount of weak brine *one day*, if very warm, or two days, if not very warm, and rub or pound them often. Then turn the liquid into a separate vessel, and salt it to saturation for keeping. This will free the rennets from what would have the strongest tendency to cause tainting. If the rennets are now covered with a new, weak brine, they can be soaked and rubbed twice as long as before without danger of tainting; and by this time their strength will be pretty well exhausted, and they may be well drained and thrown away, or dried for steeping again in cold weather, if desired. Let the second steeping now be turned in with the first, and salted with a little more salt than it will dissolve, and it will be ready for use or for keeping.

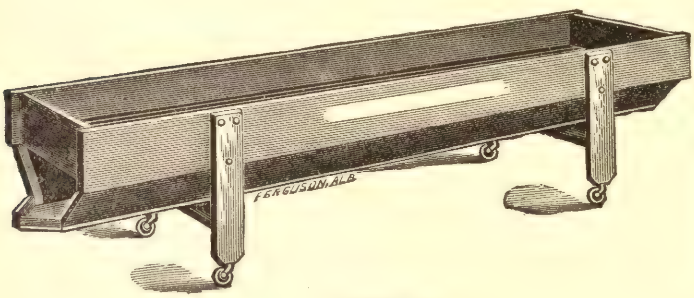
The best time for preparing rennet is in cold weather, when the soaking in weak brine can be carried on as long as desired without danger of spoiling. Only one soaking will then be required. Cold does no injury to them, but, on the contrary, freezing helps very much in liberating their strength. The oftener they are frozen and thawed, the more strength can be got out of them. After the steeping is done, set the liquid in a cool place, and salt to saturation, and stir occasionally, and it will keep almost indefinitely. Rennets enough for a whole season's use may thus be prepared in advance, and save much trouble and waste in preparing them in hot weather. The use of tainted rennets should be carefully guarded against. The practice, quite common, of soaking rennets in whey, either sweet or sour, should be avoided, as the whey invariably tends to the injury of the cheese. Water is the best known agent for preparing rennets, and to it nothing but salt should ever be added.

Rennets are much more liable to become tainted than salt meats, and should therefore be carefully selected and prepared, as the quality of the rennet affects that of the cheese made from it very materially. The liquid should never be used without first being strained, as small pieces will be liable to be rubbed from the skins and become mixed with the curd. Wooden casks and tubs are objectionable receptacles for soaking rennets, since the wood soon absorbs and holds enough of the liquid to taint the rennets, and no washing or scalding will wholly remove it. Glazed stone ware is the best for this purpose, but care should be used in selecting that the glazing be unbroken, for unless the glazing is perfect on the inside, the slightest break or crack will cause it to absorb the liquid, and soon taint the contents of the jar.

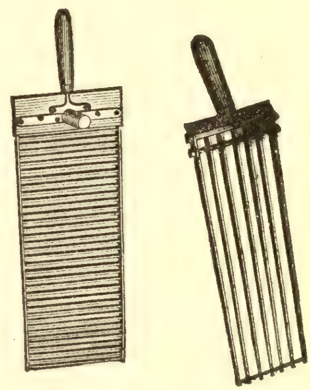
Quantity and Quality of Cheese. — The cheese factories of New York average from the common, ordinary dairy stock, during the entire grazing season, about ten pounds of cheese to one hundred pounds of milk, the cows being fed on grass in the usual way. Although the milk of some cows will produce considerably more than this quantity, and others less, the above mentioned quantity has been found to be about the average standard for cheese in the factories where there is such a large quantity of milk and a mixture of different qualities from various sources. Cheese that is less firm in texture than that designed for exportation, will contain considerable moisture, and will probably average more than the abovementioned average.

The imperfect separation of the whey from the curd is frequently the cause of deteriorating the quality of the cheese. If the process of the separation of the curd from the whey is hurried too much by the curd being broken too soon, the whey will not drain off properly, and when this separation is imperfect, no amount of pressure afterwards applied will remedy the evil. If the curd stands too long before being broken it will be tough and firm, while if broken too soon, besides retaining the whey as above mentioned, much of the fatty matter will be pressed out and lost, consequently the cheese will contain less of the butter element than if the process of separation had been more slow and gradual. Such cheese will be liable to bulge out at the sides, blister, crack, and have a strong flavor; while in being cut it will be found to lack compactness and uniformity of texture, being full of cavities.

The curd should stand sufficiently long to be coagulated, or so that it may be cut into cubes in the vat with a knife. The quality of the milk, the degree of heat employed in its preparation for setting, the quality and quantity of rennet used, manner of curing, etc., all have a great influence in determining the quality of the product.



CURD SINK.



STEEL CURD KNIVES.

Floating Curds.— The cause of this difficulty, which cheese makers sometimes have to meet, is generally conceded to be tainted milk, or milk in a fermented state. The cause of milk being in this condition may be a diseased or feverish state of the cow before the milk was drawn from the udder, or from improper treatment of the milk, lack of cleanliness, etc., after being drawn. It has been found that floating curd contains spores of a species of fungus, which generates a gas when the curd is at a temperature of from 80° to 90°. This gas causes each cube of curd to become so expanded as to become lighter than the same bulk of whey; hence it rises to the surface and floats. To prevent floating curds, avoid the cause.

The cows should have a proper amount of suitable food, and access at all times to a sufficient supply of pure, running water. Never permit them to drink from stagnant pools, or water made filthy from any cause. Every cow whose milk is used for any purpose whatever should be in a perfectly healthy condition. The utmost cleanliness should be regarded in the milking, and handling the milk afterwards, that no taint or animal odors may be found in the milk. The utensils employed in the making of the cheese should all be thoroughly washed in warm water, with soap, and afterwards scalded by steam or boiling water.

Milk easily absorbs taints and odors from the atmosphere and other sources, and too much precaution can scarcely be taken to have everything as clean as possible pertaining to it. Sometimes poisonous weeds eaten by a single animal, or one diseased cow in a large herd will spoil the milk of the whole dairy. By strict attention to sanitary conditions and cleanliness in every particular, the evil may be avoided.

Addition of Cream or Butter to the Curd. — The quality of cheese may be greatly improved by the addition of cream to the curd, since the greater the proportion of cream or butter in the cheese, other conditions being equal, the richer the quality. The cream should, however, be well mixed with the milk at the time of setting, that the cheese may be uniform in quality.

Cutting the Curd. — When the curd is sufficiently coagulated or hardened in the vat for the separation of the whey, this separation is facilitated by cutting the entire mass into cubes. This is done by running the perpendicular and horizontal curd knives through it, — the former across at right angles, — thus effectually breaking it up.

The old-fashioned implement for cutting the curd was a single blade, wooden knife, made in the most clumsy manner. With this the curd was cut into large blocks, and subsequently broken up by the hands, which resulted in considerable labor and a loss of cheese. An improvement on the wooden knife was the breaking of the curd with wire held in a triangular frame. By having the breaker correspond with the cheese tub, and one-half its diameter, no portion of the curd would be broken twice. The next implement for this purpose was the tin breaker, which was followed by the perpendicular and horizontal steel knives now in use in all well regulated dairies. The object is to cut the curd into pieces of desirable uniform size without bruising or crumbling it, as any undue agitation of the mass by rough handling results in a loss of some of the best elements of the cheese.

Coloring Cheese. — It is a fact well known to all butter makers that when cream becomes too warm in the churn, the butter is invariably light colored. The same principle holds true in cheese making, and, as it is necessary to heat the curd to make cheese, this heating process has a tendency to take out the color. Knowing this fact, it would seem that the cheese consumers would prefer cheese of the natural color rather than an artificial coloring, since annatto — the only substance used for this purpose — adds nothing to the flavor or nutrition of the cheese.

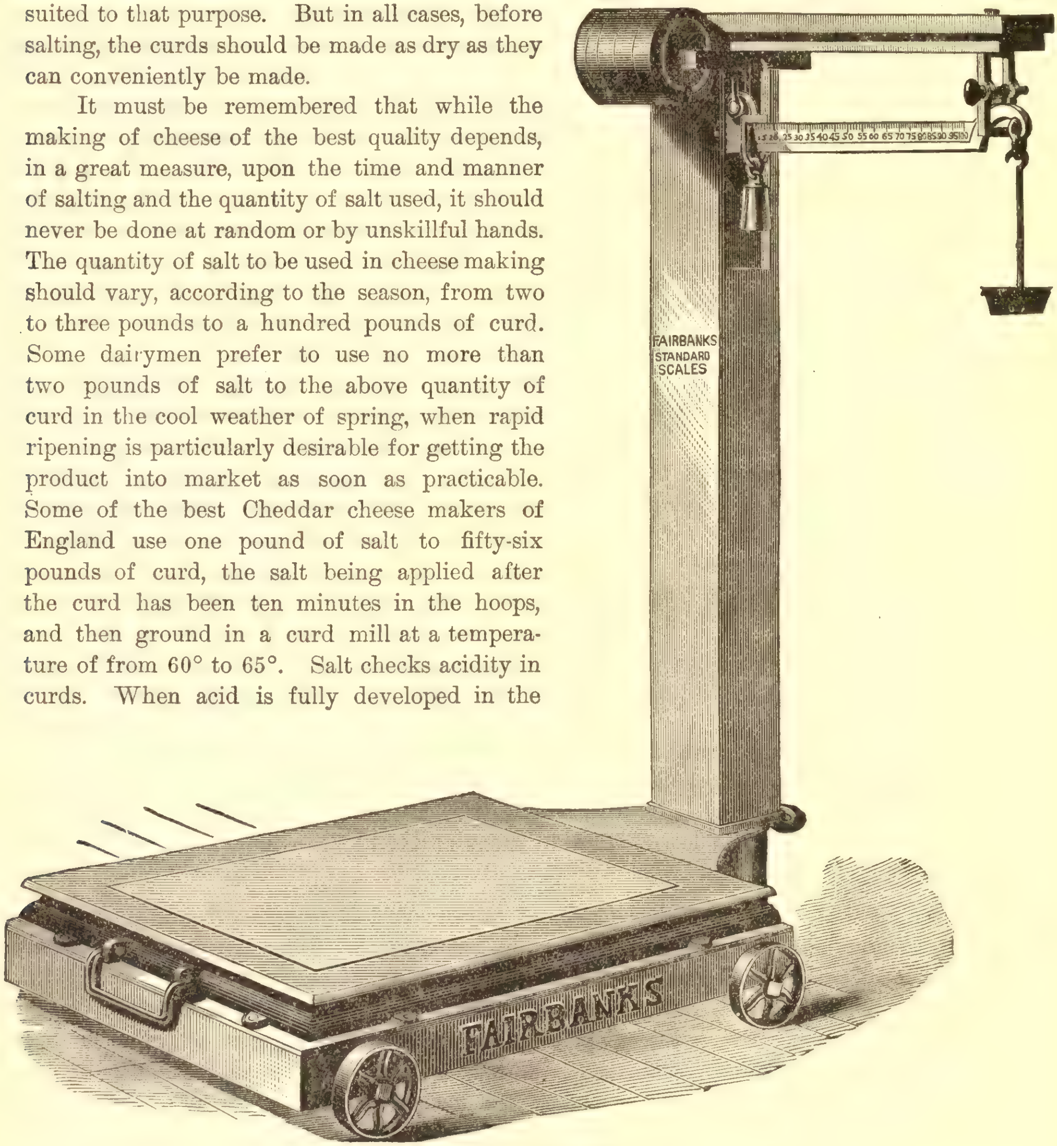
Pure annatto is prepared from the seeds of the shrub *Bixa orellana*, which grows in South America and the West Indies. It is soluble in alcohol, ether, potash, and soda, and is regarded as being in no way injurious. But it is frequently adulterated with red lead and other poisonous compounds; and when used, care should be taken to obtain, if possible, the pure, unadulterated article. As long as there is a demand for highly-colored cheese in the market, and the consumers are willing to pay a higher price for such, the dairymen will of course furnish the article; but we think it would be better if the practice of artificial coloring were abolished altogether. We would at least advise a toning down of color by the use of considerably less annatto than is indicated by many of the highly-colored cheeses at present seen in the market.

Salting Curd. — The principal object of salting curd is to preserve it in a pure and wholesome condition, although it is an important agent in also fixing the flavor of cheese. Some dairymen prefer to add the salt when the curd is warm, others when it is cold. We are of the opinion that the finest-flavored cheese can be obtained by salting the curd when it is at a low temperature. This is the common practice, strictly adhered to, in all the celebrated dairies of England. We learn from the highest authority that in the manufacture of both the Cheddar and Cheshire varieties of cheese, the maximum temperature of the curds in applying the salt is 75°, yet the best quality is made when the curd is at a temperature of 60° or 65°. When curd is salted at too high a temperature, it is apt to affect the flavor of cheese injuriously, and also to harden the curd and prevent the free extraction of the whey. The whey should be removed as far as possible before the curd is salted, as there should be no guess work about the quantity to be used.

Salt is an important agent in ripening cheese, it being found that when little salt is used

the cheese ripens rapidly and must be eaten when it is comparatively green, or it soon gets out of flavor. On the contrary, too much salt retards the ripening process, and the cheese, being long in coming to maturity, will be hard and stiff. The quantity of salt must be determined, in a measure, by the character of the cheese. With a certain quantity of salt added to the curd — other things being equal — the cheese will be ripe and ready for market in thirty days, and so on, regulating the amount of salt used by the nearness or remoteness of time between the making of the cheese and the marketing; cheese of long-keeping, slow-maturing qualities requiring an amount of salt suited to that purpose. But in all cases, before salting, the curds should be made as dry as they can conveniently be made.

It must be remembered that while the making of cheese of the best quality depends, in a great measure, upon the time and manner of salting and the quantity of salt used, it should never be done at random or by unskillful hands. The quantity of salt to be used in cheese making should vary, according to the season, from two to three pounds to a hundred pounds of curd. Some dairymen prefer to use no more than two pounds of salt to the above quantity of curd in the cool weather of spring, when rapid ripening is particularly desirable for getting the product into market as soon as practicable. Some of the best Cheddar cheese makers of England use one pound of salt to fifty-six pounds of curd, the salt being applied after the curd has been ten minutes in the hoops, and then ground in a curd mill at a temperature of from 60° to 65°. Salt checks acidity in curds. When acid is fully developed in the curd, salt applied at the proper time will check the further progress of it, and thus is made to serve a very important purpose in cheese making. Salt of the best quality should, however, always be used for cheese. Some salt has a bitter flavor, which greatly injures the butter or cheese in which it is used. Saltpetre is used in small quantities in some English

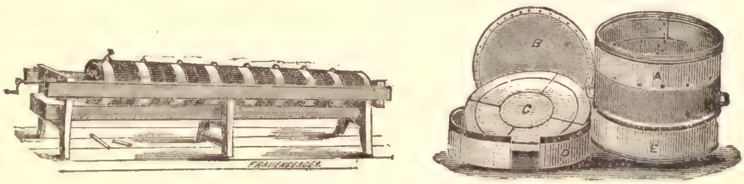


PLATFORM SCALES.

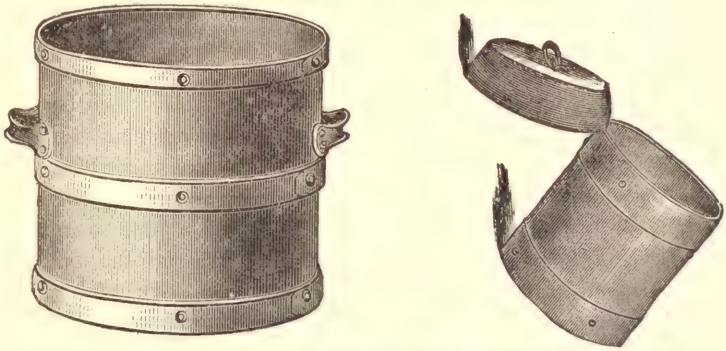
dairies, in the proportion of three or four pounds to a barrel of salt, and is thought to aid in preserving the flavor of cheese, as well as to improve its keeping qualities.

How to Distinguish Good Salt.—Many persons suppose that because salt is of a preserving nature, that all salt to be found in the market is pure, provided it looks clean; but this is far from the fact. Salt may seem to all appearance to be free from all foreign matter, and yet be so impure as to greatly deteriorate the quality of the dairy products in which it is used. Chlorides of calcium and magnesium are the substances in salt that most injuriously affect the taste and quality of butter and cheese.

The best method of determining the purity of salt is of course by analysis; but as dairymen will not always find it convenient to be obliged to resort to this means, they should be acquainted with other ways of determining its quality. One of the satisfactory evidences of the purity of salt is its dryness. All the chlorides cause salt to absorb and retain moisture; consequently the more of these chlorides it contains, the greater the tendency to moisten. Prof. Porter gives the following description of pure salt: "A chalky, very fine-grained, or pulverulent salt is not the best for dairy purposes, and would at once be rejected, I believe, by experienced dairymen. A good dairy salt ought, besides being of proper chemical composition, to be of moderately fine grain, crystalline, and transparent, and, when seen in a mass, of a pure white color; it ought to be free from odor, and possess that sharp, pungent taste characteristic of pure salt."



GANG CHEESE PRESS.

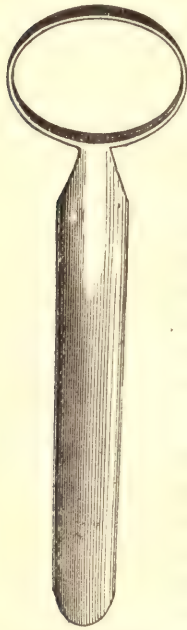


GALVANIZED IRON CHEESE HOOPS.

Pressing.—This process expels most of the whey that remains in the curd, thus consolidating it into proper form. Different sizes and kinds of hoops are employed, according to the size of the cheese to be made. Cloths are used between the curd and hoops, and should be adjusted in such a manner as to give the outside of the cheese a smooth appearance. The cheese should be occasionally turned during the operation of pressing, which generally takes from eighteen to twenty-four hours, and the press cloth renewed, after which it is taken to the curing room, and turned each day and rubbed with hot butter made from the skimmings of whey, to prevent cracking. The pressure should be at first gradual, since, if too great, the white liquid which flows will drain away what will contain some of the best elements of the cheese. Various kinds of presses are used. The gang press is now employed quite extensively in large dairies and cheese factories.

Curing or Ripening.—The ripening of cheese is the result of a slow process of fermentation or decay, which involves the decomposition of the casein and other matters, and which develops the peculiar flavor and odor of this product of the dairy, so different from

that of the curd. The rapidity and character of the ripening process depends much upon the quality of the milk, the method of curdling, the amount of whey remaining in the curd, quantity of salt used, and the treatment the milk and curd have received generally.



CHEESE TRIER.

As a general rule, the less whey the curd contains, and consequently the more hard and compact the curd is, the more the air is excluded, the less rennet and the more salt used in proportion to the curd, the more slow will be the curing process; while the more moist the curd is, or where the conditions opposite to those above mentioned exist, the sooner will the ripening process commence and be completed. Cheese curing rooms should be of a uniform temperature, not exceeding 75°, nor below 60° F. The best cheese may be spoiled by having the temperature of the cheese room either too high or too low, or, if the temperature varies largely at different times. Cheese should be turned often, and also be well rubbed with hot whey butter while curing, especially in the early stages. A cheese is considered cured or ripe when the flavor peculiar to cheese has become well developed.

Cheese-making on a Small Scale.—Where but two or three cows are kept, it is better for the farmer to buy his cheese than to attempt to make it on the farm. Where a farmer lives remote from a cheese factory or market, it would be a good plan for several small farmers to unite in cheese-making, delivering their milk daily at some central neighbor's house where the cheese is to be made, the labor involved being no more to handle ten or fifteen pails of milk, than four, while the cheese would be of much better quality than if the curd were kept from different milkings until a sufficient quantity were obtained to make a cheese of suitable size.

If this method is not followed, and the farmer perhaps prefers to make a few cheeses from his own cows exclusively, it may be done very easily from the milk of from four to six good cows. We have eaten excellent cheese made from so small a dairy, when under proper management. Twenty-five gallons of milk will, on the average, make a cheese of about twenty pounds weight. A hoop eleven inches in diameter, and about the same height, will answer for a cheese of this size. The other requisites are a cheese-tub to "set" the milk in, a basket, and strainer cloth for draining the curd, and a press of suitable size to accommodate the size of the cheese to be made.

A kettle or boiler is sometimes used for setting the milk, but a wooden tub is better than metal, since it is a poor conductor of heat, and the milk will consequently retain the heat longer. But a metal-lined tub of wood is better still, because the metal will prevent the milk and whey from soaking into the pores of the wood, and the non-conducting wood will hold the heat. The milk may be heated by a common cooking stove, care being used not to burn it. We would recommend the use of a thermometer in testing the degree of heat, which should be from 80° to 84°. The rennet should previously be prepared, according to directions already given, and be ready for use. A good rennet, properly prepared, will curdle about 2,000 quarts of milk, but there is much variation in strength. The quantity to be used must be determined by experimenting and testing its strength, and should be sufficient to cause curdling to commence in fifteen or twenty minutes at the above mentioned temperature. When firm enough to separate readily, cut it into columns about an inch square, with a knife that will reach to the bottom of the tub, and leave it twenty or twenty-five minutes for the whey to separate, first covering it well to prevent the escape of the heat.

After standing the above length of time, the whey should be separated from the curd in sufficient quantities to cause the latter to settle considerably. The whey should then be carefully dipped from the top, after which the columns of curd may be carefully broken with the

hand, being cautious not to bruise or crumble it into fine pieces. Curd knives for horizontal and perpendicular cutting of the curd are the best implements for this purpose, and much to be preferred to hand breaking. After this is done, heat the whey that has been dipped off, or an equal amount of water, to 150°, and turn this over the curd so that all parts may be scalded alike. Stir it carefully, so as not to wash out the richness of the curd. Cover the curd again to prevent its cooling, and let it stand as long as it can without sticking together, which will be about twenty minutes. Then the whey may be dipped off again, and the curd drained on a strainer cloth over a basket, which will allow the whey to run off freely.

In about half an hour, by occasional turning and cutting, it will be sufficiently cool to be returned to the tub, chopped rather fine, so that the salt will distribute evenly, and salted at the rate of about one ounce of salt to twelve quarts of milk used; the rule with some being a teacup full of salt to a cheese weighing ten or twelve pounds. The salt should be evenly mixed with the curd when cool, which is then dipped into the hoop having a cloth spread in it. It should then be put to press, the pressure at first to be quite moderate for a few hours. As soon as the curd unites together so that it can be handled, remove it from the press, put in a dry press cloth, turn the cheese, and fold the cloth evenly, to make the surface of the cheese as smooth as possible, and press again, until the press is wanted for another cheese, the usual time for pressing being from eighteen to twenty-four hours.

After taking it from the press, let it stand about two hours until the outside becomes a little dried; then rub it well with hot whey, butter, or other soft grease, turning and rubbing it thus daily until cured, which will require from thirty to sixty days, according to the amount of moisture it contains, and other conditions. Great care should be used not to press the cheese too heavily, or a milky white liquid will flow, which will drain away the best part of the cheese.

Sage Cheese.—The old-fashioned sage cheese, that was formerly considered such a luxury, is sometimes seen in the market at present, and may be very easily made. For a small cheese of about ten pounds weight, two handfuls of green sage and one handful of parsley leaves are bruised and washed in new milk over night. When the milk is set next morning, about one-third is set by itself with this colored milk added to it; the other two-thirds of the milk is set, both being treated alike, as has been just previously described in making cheese on a small scale. When the curd is ready to go into the hoop, put in a layer of the white curd; then a layer of the sage-colored curd; and so on, in alternate layers. In pressing, the color is more or less distributed through the cheese, giving it a marbled appearance. Various flavors and colors are worked in by this method, wintergreen leaves, etc., being sometimes used for this purpose.

The Cheese Fly.—This is a great nuisance in the cheese-room. Mr. Willard says:

"Most dairymen understand pretty well the habits of the cheese-fly; many, however, do not understand how to provide against its depredations. Some people profess to be fond of a skippery cheese, and regard it as an index of what the English understand as a 'cheese full of meat'—that is, rich in butter. And it must be confessed that the cheese-fly has a great partiality for the best goods in the curing house. They do not so readily attack your 'white oak' and skim milk varieties; hence the notion that cheese infested with the fly is rich in butter is not far out of the way.

The primary cause of skippery cheese, of course, is want of care. Cheese in hot weather should be closely examined every day; they require to be turned once a day to facilitate the curing process; the bandages and sides are to be rubbed at the time of turning, in order to brush off or destroy any nits of the fly which may happen to be deposited about the cheese. If there are cracks in the rind, or if the edges of the bandage do not fit snugly, they should at once be attended to, since it is at these points that the fly is most likely to make a safe deposit of its eggs."

Filling up the Cracks.—"The cracks and checks in the cheese should be filled up with particles of cheese that have been crushed under a knife to make them mellow and plastic. When once filled, a strip of thin, tough paper, oiled and laid over the repaired surface, will serve as a further protection of the parts. The cheese in the checks soon hardens and forms a new rind. Deep and bad looking checks may be repaired in this way, so as to form a smooth surface, scarcely to be distinguished from the sound parts of the cheese. It is a great mistake to send cheese that have deep checks or broken rinds to market; for in addition to their liability to be attacked by the fly, they have the appearance of being imperfect, and are justly regarded with suspicion."

Boxing and Packing.—"In boxing cheese, whether for export or the home trade, the greatest care should be taken to have the packages well made, and with an extra band on the lower edge. Cheese should never be sent to market until they have properly ripened, and they should be placed in boxes that fit—boxes that slip down easily over the cheese, but not so large as to allow 'shaking,' or a movement from one side to the other in the box, nor in so small a package as to prevent their being readily removed from the package without breaking it. Good, substantial scale-boards should be placed on both sides of the cheese, and no other material is so well adapted to the purpose where cheese is to be exported, or is to remain some time in the package during its transit to market. For short distances heavy straw paper may be used, but care should be taken not to pack with newspaper, as the moisture from the cheese will reduce it to a pulp, giving the cheese a very bad appearance on removal from the box.

When the cheese is in place, the sides of the package should come up just even with the top surface of the cheese. If it is below this surface the cheese will be liable to be broken and marred about the edges. If the rim of the box be a little higher than the cheese, it should be trimmed down after the cheese is in the box with a sharp drawing-knife, and then covers that fit closely should be adjusted. Sometimes the boxes are very imperfectly made, with loose-fitting covers that are liable to fall off in rolling the cheese from the scales, or in moving from place to place. In such cases the covers are sometimes tacked in place with nails, but when nails are used, care should be taken that they do not reach through the wood and into the cheese.

The boxes should be neatly branded with the name of the factory, or if from farm dairies with the name of the dairyman, and for this purpose stencil plates are most convenient, while the lettering makes a neater appearance than when the names are burned on with branding-irons."

Profits of the Dairy.—The products of the dairy are among the most useful and delicious articles of diet. In these days when oleomargarine is disguised as butter, and when lard, cotton-seed oil, and other adulterants are mixed with cheese, and a conglomerate of skim milk, water, chalk, and burnt sugar is palmed off to customers as pure milk, dairy products of the best quality cannot fail of being appreciated by consumers, and the demand for this quality far exceeds the supply; hence, being standard articles of commerce, they will always be in demand, and command good prices. Dairying, for the last twenty years, has been very remunerative in this country, and is rapidly becoming more so. Besides the great demand at home, there is also a large demand abroad. England, one of the wealthiest nations on the globe, is desirous of procuring our surplus dairy products. The annual importations of butter and cheese in England amount to more than $75,000,000, while the demand at home is constantly increasing. There is no danger of the market being cloyed, and when a good article is produced it will always find a market. Mr. Willard sums up the requisites of profitable and successful dairying as follows:

"In summing up the requisites for successful dairying, I would say: 1. Make a good selection of stock adapted to your wants; then, whether the animals be thoroughbreds,

grades, or common cows, test the milk of every cow as to quantity and quality. 2. The next important step is care and feed. Nothing pays better than kind treatment. Cows should have clean, comfortable, well-ventilated stables. They should be driven leisurely — never faster than a walk; never whipped or beaten under any circumstances; they should never be worried or fatigued by dogs, and a uniform kindness should be shown, extending even to the tones of the voice. Let the attendants pet the animals daily, handling them tenderly, and gaining, if possible, their entire confidence and affection. Harsh treatment, neglect, and want of care not only lessen the quantity of milk, but not unfrequently render it unwholesome, and even poisonous. Numerous instances can be pointed out where cows that have been whipped, frightened, or in other ways abused, have yielded milk that has caused disease and death to persons using it. 3. Cows, to make good returns in wholesome and rich milk, must be fed well. The sweet and nutritious grasses growing upon old pastures are among the best of all foods for the production of good milk. When ground grain or meal is to be fed, one of the best mixtures is ground oats and bran, or ground oats and peas. Pea meal and bran mixed promote a good flow of milk of excellent quality.

When pastures are inferior or scanty, rations of the above may be fed to advantage, while the cows may be soiled with fodder corn, green clover, and the like, as supplementary to pasturage. The use of corn meal in summer is not so well adapted for feed as it is in cool weather. In fall or winter it makes an excellent ration with ground oats and bran. Roots, in their season, are also valuable — carrots, mangolds, and parsnips being among the best for good-flavored milk.

4. As milk is composed of eighty-seven parts water, with its other constituents, it is of the utmost importance that clean, fresh water be supplied to cows in such abundance that the animals can obtain it at will, and are not required to travel long distances to slake thirst. Stagnant water, or that from sloughs, cesspools, or other filthy places, injures the milk of cows partaking of it; and, if such water is mostly depended upon for the dairy, neither first-class butter or cheese can be produced. When springs and streams cannot be had, wells should be dug for supplying stock with water; and, by having pumps worked by wind power, good, clean water can be kept before the stock at small expense and trouble.

5. Having made provision for obtaining good milk, the all-important requisite to be considered is cleanliness. Everything about the dairy, the pails and utensils, must be kept scrupulously neat and clean. In washing dairy utensils, something more than cold and warm water will be required; the use of steam, or water *boiling* hot, must be employed to kill the germs of ferment that will accumulate from day to day in the corners, seams, and other parts of the utensils and implements. The milking must be done in the most cleanly manner. Immense quantities of bad-flavored goods result from careless milking, whereby droppings from unclean udders, particles of manure, and other filth are allowed to fall into the milk while milking.

Again, the milking stables are often badly ventilated, and are foul with emanations of decomposing filth; and, as milk absorbs these gases with great facility, good milk is often injured before it leaves the stables. Milk should at no time come in contact with offensive odors, and care should be taken where the dairy buildings are located, so as to escape the fumes of the stable, the pig-sty, or other decomposing form of vegetable or animal matter.

These few points are the stepping-stones to success in the dairy, and cannot be ignored with impunity."

Stock fanciers have done much towards the promotion of agriculture and its interests throughout the civilized world, and consequently the increase of national wealth and prosperity; and such men as Bakewell, Collings, and their congeners may be regarded as public benefactors, for they have devoted their means, time, talents, and energies towards the improvement of domestic animals of all kinds, and to their untiring devotion to this cause the farmers of to-day owe their fine stock and the profits thereby derived.

SHEEP.

THE history of sheep husbandry dates back to a period almost as remote as that of the human race, and from that time until the present, sheep have been regarded as indispensable to man's comfort and welfare, whether among the nomadic, semi-barbarous tribes, or those races characterized by the highest civilization the world has ever known. Sheep husbandry has justly been regarded by all civilized nations as worthy a most prominent position in agriculture and commerce ; in fact, the record of progress in civilization for more than a century past, shows a similar progress in the improvement of this useful domesticated animal. From the time of Abel, brother of the first born of the human race, who is referred to in the Scriptures as "a keeper of sheep," until the present, they have been regarded as a source of profit to the keeper ; and when Fitzherbert as long ago as the year 1534 said, "Sheep is the most profitablest cattle a man can have," he not only expressed a truism suited to his own time, but an opinion in which the majority of agriculturists of the present day fully concur. If this were true of the flocks of his time, how much more so of the perfected breeds of the present period.

Their flesh is highly valued by all classes, is wholesome and nutritious, and furnishes no small per cent. of the meat supplied by our markets; their wool furnishes one of the most valuable materials for clothing etc. that can be procured, while they are an important source of revenue to the farmer, and also furnish a most valuable means of maintaining the fertility of his lands. In some countries they are raised principally for their wool; in others for their flesh, where mutton is the principal meat diet. It is surprising to note the improvements that have been made in this animal even during the past century, those bred a hundred years ago presenting a very ungainly appearance, with long legs, the fleece being small and of an inferior quality; they also yielded a smaller amount of meat of poorer quality, and required a long time to mature. By careful and judicious propagation, new breeds have been produced that supply wool of the long and fine fiber, with a much larger proportion of profitable meat of better quality, and with quickened growth and maturity, which latter fact is of no small import to the farmer respecting the profits to be derived from rearing them. Perhaps no animal in the brute creation, unless it be the dog, exhibits a greater diversity of character than the sheep. This variation is seen in form, size, color, length, and texture of wool etc., and no animal is more widely distributed throughout the different zones and climates, or subsists on a greater variety of food. It is found in every latitude from the equator to the arctic, on the bleak shores and mountains of Greenland, and the burning deserts of Africa, and subsists upon grasses, shrubs, weeds, grains, roots, leaves, barks, etc. In some countries where the winters are extremely severe, it is said, in times when other resources fail, to subsist upon fish or flesh, as is often the case in Lapland. When driven to great necessity from hunger, sheep have been known to eat their own wool. Numerous instances of the latter kind have been known where they have been temporarily covered by an avalanche of snow, or lost on the prairies in a severe snow storm. In the vast pine forests of Norway and Sweden, they often subsist on these resinous and aromatic evergreens when, owing to an extremely rigorous winter, there is a scarcity of other food.

Sheep vary greatly with respect to size and other characteristics. Mr. Killebrew, of Tennessee, describes these characteristics in the following manner:—

"In the Orkney Islands they are so small as to appear like toys. Like the diminutive ponies of the Shetlands, neighbors of the Orkneys, they are brought to the warmer climates as a curiosity. By the side of the massive Cotswold or Southdown they appear very little like the same species. Some have long, tapering, straight horns, like the gazelle, while others have the huge spiral horns of the mountain, or big horns of the Osage Mountains. Others, again, are without horns altogether, as are most of the mutton sheep. The same difference exists

OXFORD DOWN RAM, "FREELAND."

Imported and owned by T. S. Cooper, Oxford Park, Reading, Ohio. (Formerly of Linden Grove, Coopersburg, Pa.)

in regard to the tails. They have long, slender, vibrating tails, a broad, flat tail like those of Asia, or no tail at all, only a rudiment of one being discernible.

And thus with the covering. It hardly seems possible to connect the straight, hairy fleece of the Rocky Mountain sheep, and the long, combing wool of the Leicester or Cotswold, in the same animal. In Madagascar the sheep have short, hairy wool, hardly to be considered wool at all. In Lincolnshire it is long and coarse. In Saxony it is almost like silk, fine, curly, and lustrous. In Angola it is furry and soft as a rabbit's fur. Nor does the diversity stop here. In our own country we meet with the white and black sheep. About the Cape of Good Hope they are gray, dun, brown, buff, blue, and all intermediate shades of color. This great difference of color results from long breeding under many different climates and modes of feeding.

The uses to which these animals are applied seem to partake of the great diversity of their characteristics. The meat forms one of the standard dishes of the world. For luscious juiciness, ease of digestion. and delicacy of flavor, it has no equal. Agreeable alike to the invalid and to the laborer, it is eagerly sought by all classes. Nor is its flesh the only thing about it that forms a diet of man. Some nations use, to a large extent, the milk of sheep as well as of cows and goats. Excellent cheese is manufactured from it, and its use is thought by some physicians to be a specific diet in obstinate cases of dyspepsia. Even the wool is considered a choice dish by some of the Highland clans of Scotland. They scorch it to a crisp brownness, and eat it with great relish. The use of ewe's milk in preparing cheese, butter, and curd is alluded to in the Book of Job. The writers of profane history often speak of ewe's milk. The ewe's milk cheese has a sharp, strong taste, that, like Limberg cheese, commends itself to the taste of many people. It is often mixed with cow's milk in the manufacture of some brands of cheese, to give it a tartness not given by cow's milk alone. The butter is a pale yellow, less firm than cow's butter, and becomes rancid much quicker. The milk is thicker than cow's milk, but in other respects resembles it very much, both in taste and appearance.

The nomadic tribes of Asia live almost exclusively on the flesh of sheep, and when a patriarch assembles his family to the one meal of the day, it is generally around a large tray containing a single sheep, which serves them for meat and bread."

We believe the use of ewe's milk for dairy purposes has never been known in the United States except by a few Welsh and Highland emigrants.

Abraham and most of ancient patriarchs were shepherds. In the simple and beautiful sketch of Rachel we are told that "she came with her father's sheep, for she kept them;" and respecting the seven daughters of the priest of Midian, they "came and drew water for her father's flocks." Job had 14,000 sheep. Moses and David at one period of their lives followed the occupation of the shepherd.

While shepherds were "abiding in the field keeping watch over their flocks by night," the birth of the Saviour was announced to them. They were often used in sacrifices, and among the sacred writers were the symbols of purity and gentleness. Our Saviour is designated "the Lamb of God that taketh away the sins of the world." Homer, Horace, Vergil, Plato, Herodotus, and other famous writers of antiquity make frequent and pleasing allusions to sheep, indicating the attachment and estimation with which they were regarded by the people of that time. The improvement of sheep is supposed to have been commenced in the middle ages.

Spain and Portugal are justly entitled to the credit of having made the first improvement in these animals with reference to their wool, these two countries for more than two centuries, at one period, having been the most enterprising nations of Europe. At that time they greatly excelled in the production and manufacture of wool.

Flanders for a time manufactured most of the wool produced by Spain, Portugal,

France, and even England, but by a course of legislation with reference to the protection and increase of wool and its manufacture, England to-day takes the lead among nations in this enterprise. During the increased interest in sheep growing. and the improvement of wool in these countries at that time, and while the mania was at its height, great care was bestowed upon these animals, which to the present age would seem ludicrous. The flocks were carefully watered and tended, and the finest specimens selected and housed. Sacks were sown on their bodies, and the wool was frequently washed in wine and combed.

By such careful management for a few generations the fleeces became greatly improved in texture, fineness, and softness, but the sheep became in consequence less robust and considerably reduced. The improvement of the form and size together with the fleece, is of a more recent date, and since the increased demand for mutton, as an article of food; as a result, we now have these superb breeds that produce both wool and mutton of the best quality, and also in large quantities.

Importance of Sheep Husbandry.—Though the income from sheep husbandry in our country adds much to our national wealth, yet it might be said, when compared with England and our facilities for this enterprise,—that it had here scarcely commenced, and is still but a small fraction of what it might and ought to be, owing to the extensive and superior facilities for this important department of agriculture. Importations of wool and woolen goods amount to many millions of dollars annually, and if this money remained at home instead of being sent to a foreign country, it would materially increase our national wealth and prosperity. By producing our own wool and manufacturing it, this would be the natural result. The extensive areas of the west and many portions of the south afford admirable opportunities for sheep raising at a little expense and large profit to the farmer.

Many of the leading men of the South are appreciating this fact and turning their attention to this business and the establishing of woolen and cotton manufactories. The Western States have long been engaged in the production of mutton and wool with immense profits to that section, but the production might be largely increased to the benefit of the entire country. The conducting of extensive sheep ranches is a characteristic feature of portions of the far west, where several thousand sheep are often kept in one ranch, a single herder sometimes managing 2,500 with the help of his faithful shepherd dog, and the leader of the flock, which is generally a Mexican goat, and whose lead the sheep will follow even though it be over the sides of a precipice. But they are generally well trained and evince much sagacity in wending their way from and towards the corral, which they know will protect them at night.

In the Eastern States sheep raising must of necessity be limited, but when practiced on a small scale even, and well managed, it is found to be profitable, requiring but a small capital invested and bringing quick returns. We trust the time is not far distant when we shall not only be able to supply all our extensive manufactories with wool of home product, and thus obviate the necessity of importation for this purpose, but shall have an amount to export for foreign manufacture that shall bring an immense revenue to the nation; the amount now exported being small compared with that of many other exported products.

Hon. John L. Hayes of Boston, Mass., Secretary of the National Wool-Growers Association, and editor of the Bulletin of the National Association of Wool Manufacture, says in relation to sheep husbandry as a means of settling new territories:

"Pastoral sheep husbandry is of the first importance to the nation as the most effective means of settling and improving the vast unoccupied lands of the new or vacant States of the West and South. Of all the products of agriculture, wool is most capable of transportation; or, in other words, the greatest value can be placed in the smallest bulk, in a form liable to receive the least injury in the friction of transportation. When the freight of wheat from Chicago to seaboard costs eighty per cent. of its value, of pork thirty per cent., that of

wool is but four per cent.; wool, therefore, may be grown with profit in the districts of the remotest interior favorable to its production."

Other arguments in favor of sheep husbandry, and which in fact, might be worthy of consideration of every farmer, may be summed up as follows:

A farm can be well stocked with sheep for considerably less money than with horses, cattle, or swine, and sheep will approach nearer to utilizing *everything* that is produced on the farm than any other animal; besides, with sheep less labor will be required in converting this food into the products of the stock, and the profits will be realized sooner and more frequently than will any other farm stock, except swine. Less expenditure is required for shelter and fencing, and less labor is involved in herding, where outside pasturage is accessible and preferred, as is sometimes the case on prairies and table lands, or extensive ranches. Aside from the above considerations, a fine income on the capital invested can be realized, without the sale of the stock, which is not the case with other animals, since the profits of the wool product alone, aside from that of lambs and mutton, make the enterprise a desirable one.

Breeds of Sheep.—The distinct breeds and sub-varieties of sheep are very numerous. It would be impossible to enter into a description of each, as our space will not admit, neither would it be of special advantage to the general farmer; we shall therefore confine our descriptions and observations principally to those breeds that are considered the most valuable by agriculturists and breeders generally. Some English writers class their different varieties under three distinct heads, viz., the heavy breeds of the plains, such as the Cotswolds, Lincolns, Leicesters, Teeswaters, etc.; those adapted for downs and similar localities, such as the Oxford Downs, South Downs, Hampshire Downs, Shropshires and Dorsets; and the mountain breeds, which are the Chevoits, and the Blackfaced or Heath breeds.

Besides these, there are valuable cross-breeds that are constantly acquiring increased importance. The general classification of breeds in this country is not according to adaptation to their respective habits, but more particularly with respect to the length of the wool; thus, we have a class of fine-wooled sheep, such as the Merino, for instance, which is considered the standard and best of the class,—the distinguishing characteristic of which is its very fine short wool; then there are the British short-wooled breeds, or what are sometimes called "the middle wools," comprising a class whose wool is only of medium length and fineness, called the "middle wool" class, such as the Oxford Downs, South Downs, and the Hampshire Downs, etc.; beside these, there are the long-wooled class having fleeces of very long wool, though the fibre is rather coarse, of which the Cotswolds, Leicesters, and Lincolns are the best examples. Aside from the distinct breeds, there are a great variety of grades and natives, some of which are very valuable.

Many of the desirable qualities both for wool and mutton are secured by crossing those breeds, each of which possesses one of the qualities desired in a marked degree, thus combining the essential qualities; for example, if a farmer wishes to combine the two qualities of producing wool and mutton by a cross, this can be accomplished by crossing a Merino ewe with the Lincoln, Cotswold, or Leicester ram, thus securing a strong and hardy constitution with good size, and a grade of wool that in many localities will bring as good a price as the wool of finer fibre.

The native flocks are greatly improved by crossing with breeds of superior quality; still, the thoroughbred sheep are generally to be preferred, and they are now sold at prices that come within the means of most farmers; besides they increase so rapidly that quite a flock can be produced in a few years from a single pair.

Native blood should by no means ever be introduced into a flock of thoroughbred sheep, as it will be a great evil, and result in deteriorating the value of the flock. We do not recommend natives in forming a new flock, but where the farmer has a flock of natives in his

possession, they may be used as a basis for an improved flock through the introduction of thoroughbred blood by judicious crossing. As a general rule the natives are far behind the standard breeds, although some are much better than others; the best only should be used as the basis of an improved flock, as many are of a very inferior quality.

Mr. Harris of Moreton Farm says he can always tell an American and an Englishman when they go to examine his flock; the Englishman looks at the form of the animal and begins to talk about the weight of the sheep; he never says anything about wool; if he gets form and weight of carcass, he knows the wool will be all right. The American examines first for wool; he looks at the length of staple and fineness of fibre, and lastly weight of carcass.

MERINO SHEEP.

THIS breed is supposed to be among the most ancient race of sheep known, also the most widely disseminated at present. Various importations of Merinos were made into Sweden, Saxony, Germany, Denmark, Prussia, France, England, and other countries, from Spain before their introduction into the United States, the first authenticated importation of them that resulted in the propagation of a pure breed in this country having been made by Chancellor Livingston in 1802, he being at that time minister at the Court of Versailles. This importation consisted of two choice rams and ewes from the Rambouillet flock, and were sent to that gentleman's country seat on the Hudson. Subsequently various other importations followed, which resulted in disseminating eventually this valuable breed; but as is common with respect to any innovation, we find that when first introduced they were looked upon with distrust by the majority of farmers, and it was not until after several years had elapsed that confidence in the breed had become sufficiently established to result in their general dissemination.

It is reported by statements made by Mr. Livingston, that the breed had become so well appreciated in the year 1811, that the average price for Merino rams was $1,000, and some were sold at a much higher rate. They finally declined in value, which resulted in a more general diffusion of the breed and its crosses throughout this and other countries.

The Rambouillets were first introduced into this country from France in 1801, the importation consisting of four choice rams. Other importations succeeded, and under good management they rapidly increased and became more generally known in New York, and some of the Western States. Their wool was, however, found to be coarser in fibre than that of the Spanish Merino, while they were not as hardy as some other branches of the Merino family. Others consequently took their place, and but few of the pure-blooded Rambouillets are to be found at present in this country. The different types of the Merino breed that were originally imported into the United States, have been more or less mingled together, so that there is now probably not a single unmixed descendant that could be traced to the original stock.

The improvement of Merinos has been very marked in the last twenty years, the aim of breeders having been in the direction of large and more compact frames, a better mutton-producing animal, earlier maturity, and a somewhat coarser, but heavier and more profitable fleece. So great is the change that has been wrought in this breed in many localities through climatic and other influences, that it is almost impossible to find a flock possessing precisely the same characteristics of twenty to thirty years ago, although bearing the same name.

Merinos are now represented in various types, embracing the American, French, Saxony, Spanish, Silesian, Australian, etc., all of which are valuable and in many respects similar, though slightly differing in some points, such as size of body, fineness of wool fibre, and length of wool, etc., caused by climatic and other influences.

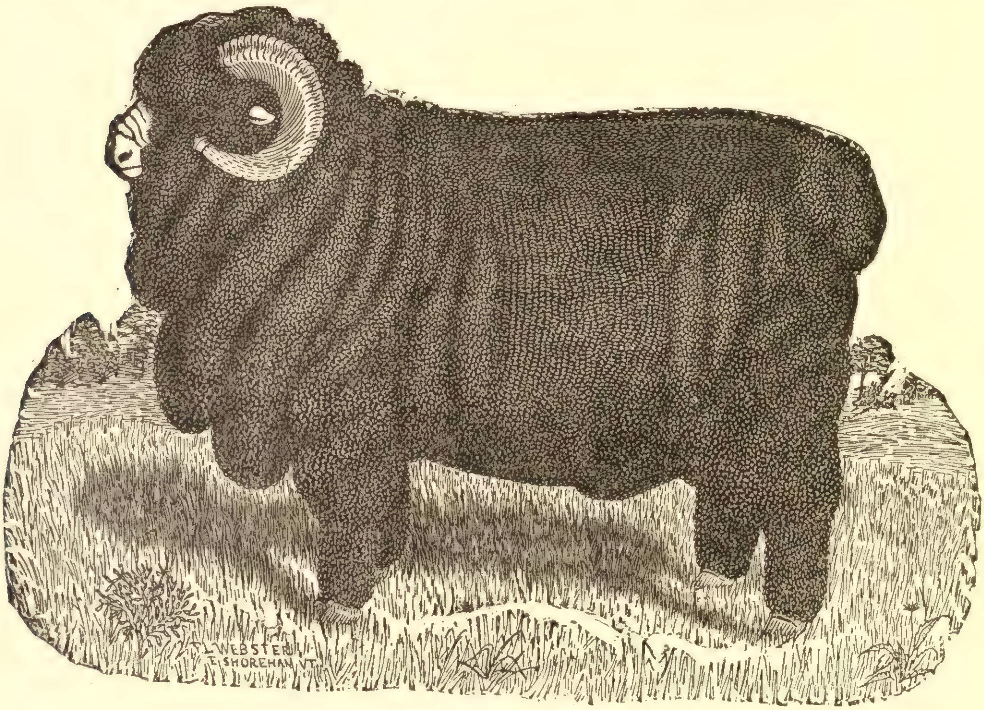
MERINO SHEEP.
Property of G. W. Hunt, Greenwood, Ill.

A change of locality, like that from their native habitat to the rich clover fields of Western New York or Ohio, for instance, produces a corresponding change, though gradual, in the breed, and forms a new type, characterized by a heavier body and fleece. The American Merino is a good illustration of this change. The ancient Greeks, having no cotton or silk, and but little linen, sheep's wool was of necessity the principal material from which their clothes were made; they accordingly took special pains and care to cultivate such breeds as produced the finest wool. Such breeds were those of the Greek city of Tarentum situated on the Tarentine Gulf. In order to render the texture of the wool still more fine, they covered their sheep with clothes during the winter, as they found by experience that exposure to the cold made the wool coarser. This practice of clothing the sheep during cold weather for several generations resulted in producing a very delicate breed with exceedingly fine wool. This product of Greek industry was transmitted by them to the Romans, and were crossed by them with rams imported from Africa, producing a stronger breed which combined the whiteness of fleece of the sire with the fineness of fleece of the dam, and thus the race was perpetuated. The scarcity of other fine textured sheep made these Spanish sheep so valuable, that it is stated from authentic sources, that in the beginning of our era they were sold for $1000 in gold per head, which was an enormous price for that period, when money possessed much more value than at present. The same authority says: —

"When the barbarians invaded Italy, these sheep were all exterminated, while the greater portion of the Roman possessions were laid waste. But in the less accessible mountain regions of Spain, the Moors preserved the breed; and it is to them that modern Spain owes the Merino sheep, which are the direct descendants of this cross breed of the Greek and African ancestors. It is a valuable inheritance, too, which that country owes to the combined Greek, Roman, and Moorish civilizations, and of which our California wool growers also reap the advantages, by the prosperity of this breed of sheep, which was there a few years ago."

The prominent characteristics of the Merino are the abundance and fineness of its wool, its crimped or spiral form, and the large quantity of yolk it contains, giving it greater softness than that of other longer-wooled breeds. The yolk is a peculiar substance secreted from the skin of all sheep, and which is contained in the wool to a greater or less extent. It is of the natrue of potash soap, and may be washed out by water alone with which it forms a kind of lather. On the outside of the fleece the dust adhering and mixing with the yolk forms, when combined with the compactness of the wool, a kind of crust which offers considerable resistance in repelling snow, wind, and rain. On opening this outer crust, the wool of the Merino is found of a golden tint and soft and glistening with yolk. The abundant supply of yolk in the Merino enables it to endure exposure better than most other breeds. Though natives of a warm climate, they soon become acclimated to an extreme cold temperature, and are successfully reared as far North as Sweden; their wool in such climates however loses somewhat of the fine texture that characterizes it in warmer regions. The Merino is also of vigorous constitution and very long lived, sometimes producing healthy lambs at the age of twelve years and even older; though not so prolific as some breeds, they breed, however, regularly, until seven or eight years old. They are healthy and hardy and will thrive where some breeds would utterly fail; will live on light pastures, endure heat remarkably, and herd profitably, usually doing well in either large or small flocks, and are remarkably adapted to very warm or cold climates. Notwithstanding the health and longevity of the breed, the lambs when first dropped appear more delicate and feeble than those of any other breed, but after a few days they seem equally strong as others, and the percentage of loss from disease after this period is usually less in a Merino flock than those of others. They are, however, slow in maturing, and do not generally cease growing until three years old, which renders them less desirable than some others as mutton sheep. They are considered by breeders very valuable to cross with the common, native stock, as they readily transmit their good qualities, and even greatly improve a flock of native sheep. The general average of lambs is about eighty per cent. of

the ewes. The Merino is described generally as a small-boned sheep of medium size, compact form, light in the shoulders and chest, and in this respect more deficient in form than the best mutton breeds, being better for wool-production than mutton. The weight of ewes will average from sixty to seventy pounds; the rams varying in weight from one hundred to a hundred and fifty pounds. The group of this breed of which we insert an illustration represents truly fine animals, the property of G. W. Hunt, of Greenwood, Illinois, who has been a successful breeder of this variety for sixteen years. One of the ewes represented recently clipped 16¾ lbs. of wool, and the other 15½ lbs., both only of one year's growth.

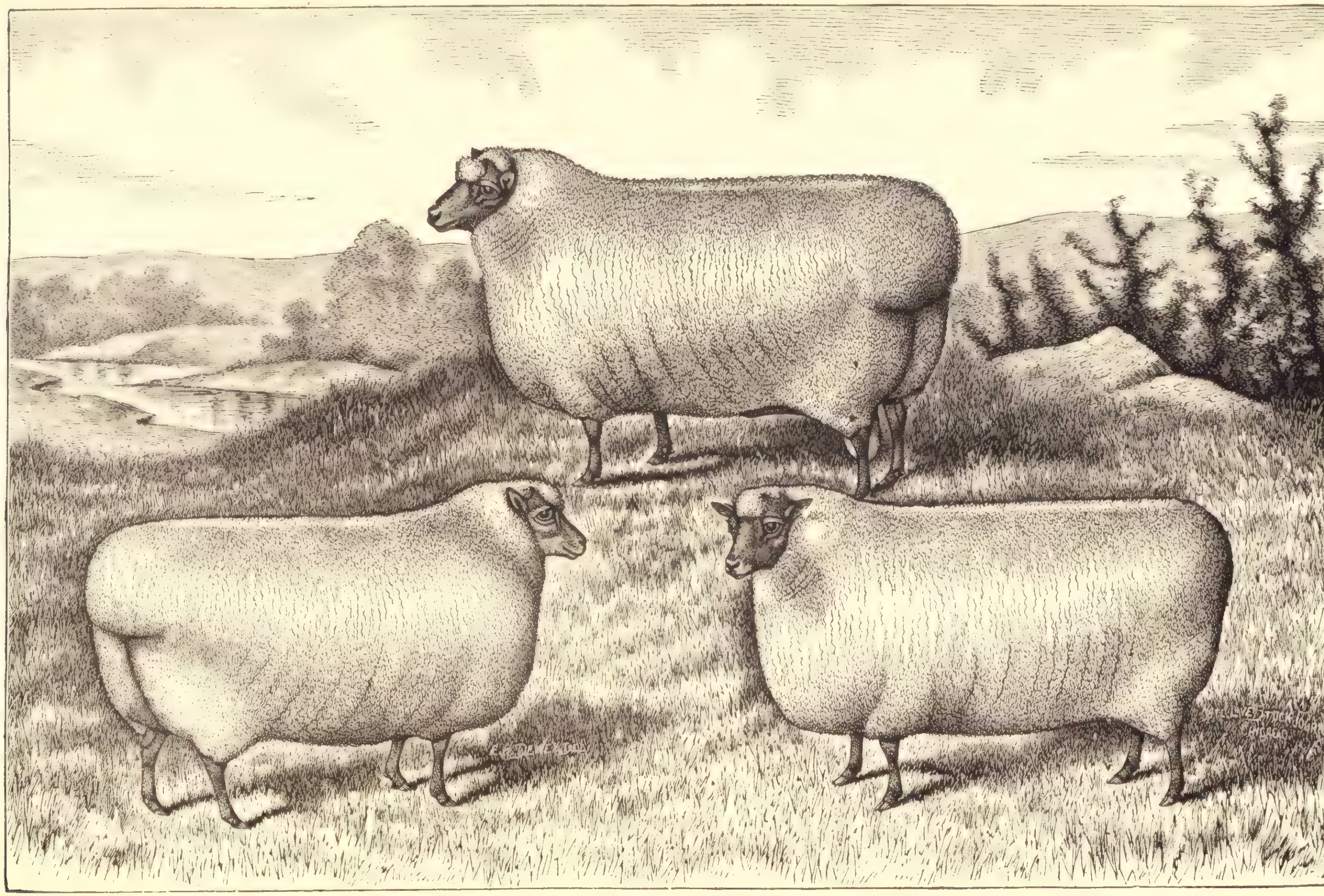


MERINO RAM "JASON."
Owned by Messrs. Dean and Jennings, West Cornwall, Vermont.

The above illustration represents the famous ram "Jason," bred by the late Col. E. S. Stowell, and now owned by Messrs. Dean and Jennings of West Cornwall, Vermont. This valuable animal composed one of the flock to which was awarded the gold medal at the Vermont State Fair in 1881, and is one of the finest specimens of the Spanish Merino race of sheep in this country.

OXFORD DOWNS.

THIS comparatively new and popular breed was produced by a successful course of cross-breeding of Cotswolds with the Hampshire ewes, with occasional mixture of Southdown blood, the Cotswold ram and Hampshire Down ewe being the chief material which, by judicious blending and careful selection, have resulted in a breed of sheep that, all things considered, can hardly be surpassed for the production of both mutton and wool. This breed was produced about fifty years ago, in the county of Oxford, England, from which it takes its name. Though comparatively but recently introduced into the United States, it is gaining favor rapidly, and bids fair to become widely disseminated



OXFORD DOWN YEARLING LAMBS.

Sired by "Freeland." Bred by and property of T. S. Cooper, Oxford Park, Reading, Ohio. (Formerly of Linden Grove, Coopersburg, Pa.)

throughout the country. The aim of the originators of the breed was to obtain an animal that possessed the weight of the long wooled sheep, with the quality and characteristics of the Downs, and the best types of the breed show how admirably they have succeeded.

Description. — Good English authority prescribes that the Oxfordshire Downs should have "a nice, dark color, the poll well covered with wool, adorned with a top-knot on the forehead; a good fleece of wool, thick on the skin, but not too curly; a well-formed barrel, on short, dark legs (not grey nor spotted), with good, firm mutton." The weight of the wool for a whole flock is estimated to be, on the average, about seven pounds per sheep, while rams have been known to cut as much as twenty pounds per shearing. The Oxford Down is characterized by great hardiness of constitution, large size, heavy fleece, facility for fattening, and excellent mutton. It is adapted more particularly for mixed soils, and bears close stocking and confinement well. They are larger than either Southdown or Shropshires, bear more wool and of a longer staple, their wool being long enough for combing, and nearly as long as the Longwools, while they have the dark faces which characterize the Southdown, although not quite as dark as the latter. It is difficult for one not an expert, or familiar with the breed, to distinguish between the Shropshire and the Oxford Down.

Mr. George Gardener, of Canada, an English farmer of extensive experience, states his opinion of the breed as follows: "Having a thorough knowledge of the Oxford Downs, from living within a few miles of the part where this breed was originated, I can state positively that there is not a more profitable variety in existence. These sheep are a complete answer to all those who will not allow that good ever arises from crossing, as they were a direct cross between the Cotswold on one side and the Hampshire Down on the other; and the Oxford Downs are now an established breed, and continue to be distinct, and follow true to parentage, without any uneven look in the flock which will occur at the commencement of a direct cross between two pure breeds. . . . . The Oxfordshire Down is decidedly the largest of all the Down species, and cuts more wool; and the reason that they continue to gain favor in England is that the mutton from any kind of Down sheep makes more per pound, and is always more readily sold. The Oxford Down lies better within hurdles, and comes to very early maturity, — also cuts a heavy fleece, as well as being of superior quality. Any one may depend upon them for being a very profitable breed, if well fed; for they will cut 10 or 12 pounds of wool at 14 months old, and weigh 120 pounds, dressed weight, on turnips and hay, if the hay is cut when the grass is coming into bloom."

They are a large, handsome sheep, and aside from the profits resulting from breeding them, are farther satisfactory in an æsthetic point of view to a farmer who has a keen appreciation, and an eye for beauty and fine points in an animal. Like most of the thoroughbred stock, they may be used with great success in improving the native stock of the country.

A cross upon the common sheep or grades of other varieties results in early maturing lambs for city markets, or when kept for general use, they will develop into a flock characterized by many desirable qualities, which the average farmer can turn to profitable account, and are worthy the attention of breeders so circumstanced as to take advantage of the growing taste in the country for first-class mutton. A fine representation of this breed is given in the cut of the noted ram "Freeland," while that of a group of his lambs proves with what uniformity the breed now repeats itself. A few facts relative to this sheep may be of interest to the general farmer.

Mr. Cooper, the former owner of "Freeland," paid in 1876, eighty-five guineas ($500 in currency), for the rental of the then two-year old ram for the season, besides all expenses of passage to and from America, including the shepherd's expenses that accompanied him, the insurance, etc. On arriving from England, his weight was 425 pounds. He won several prizes in England amounting to over $500, but has never been exhibited in this country except at the Centennial, when he won first in his class, as well as sweepstakes as the best

ram of any age in the middle wool class, and was the heaviest sheep exhibited at that time. Mr. Cooper did not permit the animal to return to England, but purchased him the following spring.

The attention given at the present time by our prominent importers and breeders towards improving and perfecting all kinds of farm animals, cannot fail of great good to this branch of the agricultural interests of the country.

SOUTHDOWNS.

THIS breed of sheep has for a long time existed in England in the region of a range of chalky hills or downs, commonly called South Downs, from which the breed derives its name. During the last century, great improvements in this variety have been made, which have been brought about by careful breeding; consequently the Southdowns of to-day are much superior to those of a hundred years ago, in respect to size, form, quantity and quality of wool, and mutton. According to good authority, the changes that have been effected in the true Southdowns have been converting the former speckled faces to a uniform tint of brown or fawn color, sometimes approaching a gray; the forehead and cheeks have been partially covered with wool; a greater symmetry of form has been obtained, with increased size and fattening aptitude, together with improvement in quantity and quality of wool.

About a hundred years since, Mr. John Ellman, of Glynde, Sussex, commenced patiently and perseveringly to attempt the improvement of the native sheep of the downs, and after a few years succeeded in bringing them to a great perfection with regard to a more symmetrical and profitable form, superior flesh and fattening powers, and early maturity, without injury to the constitution. His success was so great that he formed a flock from which the best blood of the breed has since been derived.

Other breeders, particularly Messrs. Webb and Grantham, have made further improvements, beginning where Mr. Ellman left them, and succeeded in often bringing the weight of rams to two hundred pounds. The wool, formerly short, has been lengthened considerably, and is now used in England as a combing wool, the quality of the best types of the breed being little inferior to that of the Merino.

Description.—An English writer describes the Southdowns as follows: "They have a close, set fleece of fine wool, weighing, when the animals are well fed, about four pounds; their faces and legs are of a dusky brown color, their necks slightly arched, their limbs short, body broad and compact, offal light, and the buttock very thick and square behind. They are less impatient of folding, and suffer less from a pasture being thickly stocked than almost any other breed."

The Southdowns will subsist on light pasturage, but of course thrive best when well fed; and, where wool and mutton are both desired, are a profitable breed for any farmer. They attain early maturity, are hardy and prolific, often producing two at a birth; in this respect they surpass the Merinos. Breeders of experience state that a hundred ewes will, on the average, produce a hundred per cent. of lambs, the twins occurring as often as barrenness in ewes. The lambs are large, hardy, and mature early; when eight months old they are said to dress from sixty to one hundred pounds. The sheep fatten readily, and take on the fat evenly over the entire carcass. They are not, however (as is the case with all the highly-improved English breeds), as long-lived as the Merinos, and may be considered in their prime at three years. The ewes should not become mothers until two years old. Though naturally

IMPORTED SOUTHDOWN BUCK, "LORD WALSINGHAM."

Property of Benson, Maule & Co., Philadelphia, Pa.

an upland sheep, they thrive equally well in lower sections, and are much in favor in many of the Southern States, as well as other portions of the country. They are used for crossing with the native sheep with good success.

Hampshires, sometimes called Hampshiredowns, as they belong to the family of Downs (or sheep that are natives of the downs of England), are an old and well-established breed, much resembling the Southdowns in general appearance, having the dark-colored face and legs characteristic of that breed, but are considerably larger than the latter. They are of a good constitution, hardy, possess an aptitude to fatten with a smaller amount of food than some breeds, mature early, and are good wool bearers; the average weight of the fleece being from five to six pounds, the wool being of fine quality and medium staple. The average yield of lambs is said by those familiar with the breed to be about ninety-one per cent. per annum, and the mortality of the ewes five and one-half per cent., the above average being from statistics of 10,000 Hampshires for three successive years. Like all the Down breeds, the Hampshires herd well, and a larger flock can be kept together than the larger, long-wooled varieties, while they are valuable for crossing with the native sheep and grades of our country.

SHROPSHIRES.

THE Shropshire is another branch of the Down family, partaking of the general characteristics of the Southdown, although much heavier both in fleece and body, and also much more robust. It is said to be the most prolific of all breeds, the average rate of increase in some flocks of pure Shropshires often being 150 per cent., while the product from the cross of the Shropshire ram on half-bred, long-wool ewes frequently reaches 200 per cent. Of course the increase in any breed is materially modified by the nature of the land, quantity and quality of food, and the general care and management of the flock, and no greater mistake can be made with regard to sheep husbandry than in supposing that heavy fleeces, good mutton, and a large number of strong, healthy lambs can be produced from barren land and scanty food. No animal whatever can thrive without a good supply of proper food.

We know of one instance of remarkable prolificacy in this breed, where a Shropshire ewe belonging to a small flock of about thirty sheep in the County of Waterford, Ireland, produced *five* lambs at one birth, and all of them strong and healthy! This is of course a remarkable case, and its like would probably not occur in many thousand instances, although twins, and triplets even, are very common with ewes of this breed. Mr. Samuel Smith, of Hinsdale, N. H., recently raised three lambs from a Shropshire ewe, which he sold for $18, and the wool of the ewe for $1.50, making the total profit derived $19.50. The prolific tendency of the Shropshire is a point of great importance with the breeder, as it materially increases the profits in furnishing early lambs for the market. They are also good mothers, and generally have an abundance of milk for their young, in this respect differing from many of the large breeds.

We give the subjoined relative to this breed from the *London Field,* which is considered good authority on all subjects of stock raising:

"The Shropshire sheep, though of comparatively recent origin, are at the present widely spread and much valued. On a small farm, we purchase every autumn, forty Banffshire ewes — a description of border Leicester, with a slight Cheviot cross — and serve them with a Shropshire ram. Last year thirty-six ewes produced seventy-eight lambs, all sold fat.

This season the forty ewes produced eighty-two lambs; but, owing to unfavorable causes, we lost ten lambs, or such portion of the same as have not been already treated with mint sauce. This prolific tendency is a point of great importance, for it is not with the Shropshires as it is with some of the larger breeds, that a fine single lamb is more esteemed than a double. The ewes are good mothers, and can do justice to their offspring; moreover, it is always profitable to assist nature by nutritious diet. Next, the Shropshire is a hardy sheep, suitable for a large range of soils, and capable of close folding, without sensible loss of size. The yield both of mutton and wool is far greater than from the Southdown, or other short wool breeds. Hampshires may arrive at greater weight, but they require more time. The proportion of bone and offal is greater, and the wool much less."

Mr. J. R. Dodge, so well and favorably known as an agricultural writer, describes the breed as follows: "This breed is now of larger size than the Southdown, with longer face of uniform dark tint, a full and spirited eye, spreading ears of good size, and a forehead rather flat and well wooled. They are very prolific, the ewes generally bringing doubles if well cared for, and, what is better still, the mothers are amply able to bring up the lambs in good condition. They excel the Southdowns in yield, both of mutton and wool. They scarcely attain the weight of the Hampshires, but reach maturity earlier, and have less bone and offal. Their fleece-weight is generally from five to seven pounds. The meat is like the Southdowns in fineness of texture, the presence of fat in the tissues, and richness of color. At twelve or fifteen months they will sometimes reach twenty pounds per quarter. They bear close folding well, are found hardy in moist climates, and will endure a wide range of soils and feeding."

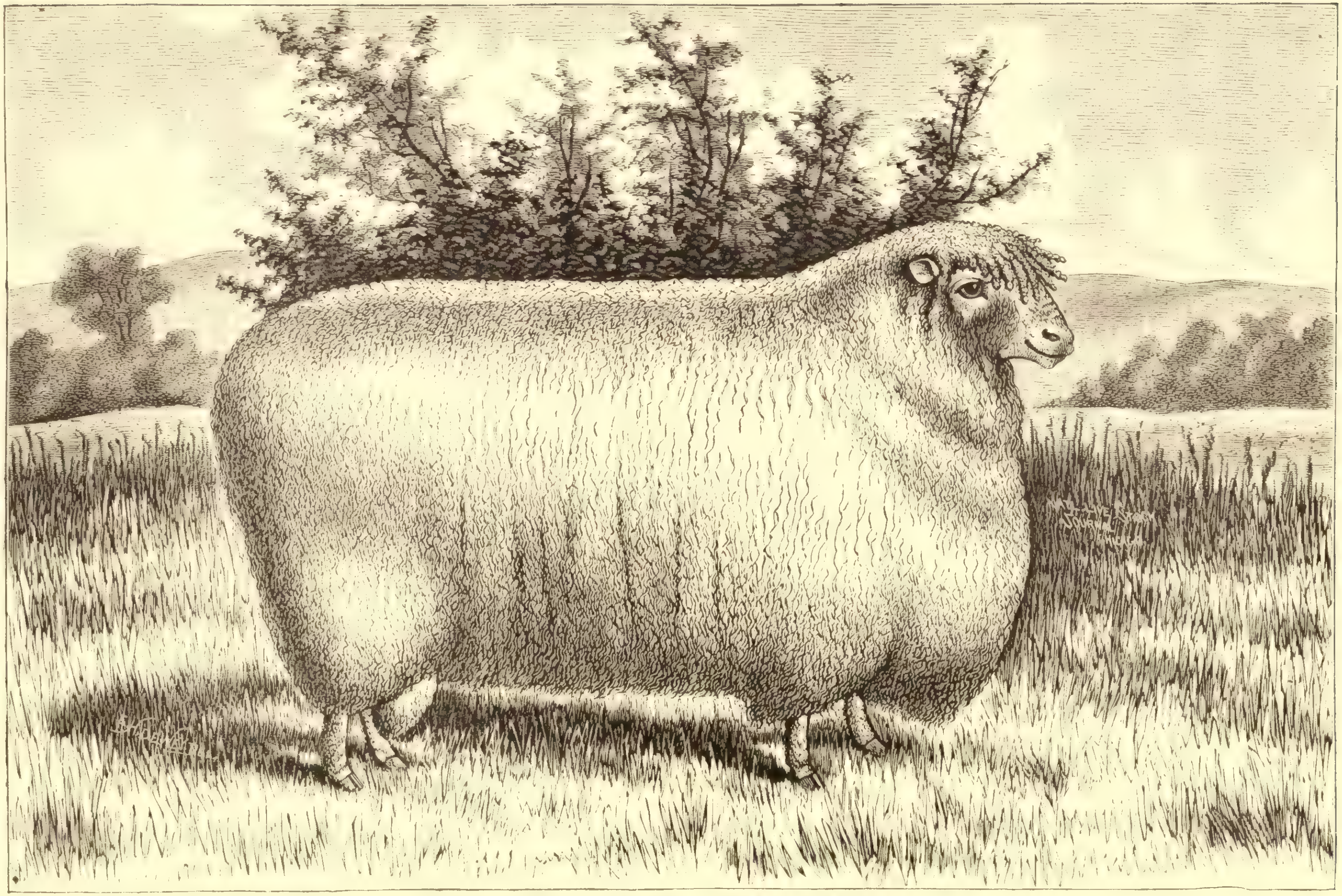
They are peculiarly adapted for crossing with the long-wooled breeds, and readily impress their desirable qualities upon their progeny.

The Long-Wooled Breeds.—Of this class of sheep, the principal breeds are the Cotswold, Leicester, and Lincoln, the Cotswold in this country being the most numerous and popular; but in England, where they have their origin, Cotswolds and Leicesters are regarded with about equal favor.

The long-wooled sheep are the largest known and produce the best quality of combing wool, which is admirably adapted by its length and lack of felting properties to the manufacture of worsted, bombazine, etc.; besides, it is used in manufacturing blankets, carpets, and other coarse woolen materials requiring great length of staple in the wool. This class of sheep are also valuable for mutton, fatten readily, and are strong and hardy.

They are hornless, with white, open faces of very long wool of rather coarse fibre, are docile, but less timid than the Merinos and some other varieties.

These breeds are said to have been originally coarse, long-legged, and rangey, but always yielding large fleeces. About a hundred years ago the celebrated English breeder, Bakewell, made marked improvements upon the Leicesters, beginning by selecting the best animals of the flock, and by good feeding and general management, always selecting the choicest animals for perpetuating his flock, eventually produced a breed characterized by such an improvement upon the original stock as to render them, in all essential points, an entirely different breed, and one which the improved Leicesters of the present time furnish us a good type.



COTSWOLD RAM, "STANDARD."

Property of T. L. Miller, Beecher, Ill.

COTSWOLDS.

THIS is one of the largest English breeds, and the most popular of the long-wooled class in the United States; it is also a breed of great antiquity. The improved race is slightly smaller than the original, owing, as is supposed, to the influence of the Leicester element in its amelioration. They were formerly called "Glo'sters," or "New Oxfords," and have been greatly improved during the last half century, by careful breeding. The qualities for which they are prized are the excellence and quality of the fleece for combing wool, their hardiness, docility, aptitude to fatten, and the great weight to which they attain; their chief defect, according to some English writers, being that the mutton is apt to possess an undue proportion of fat, and is not marbled (or has the fat distributed amongst the lean meat) like the Southdowns and some other breeds; still, other equally good authorities claim that the mutton produced by this breed is second to none in any respect.

The Cotswolds produce a heavier fleece than the Leicesters, though not of so fine a fibre; the ewes are prolific breeders and good mothers, generally having an abundant supply of milk for their lambs, which are large-framed and hardy. This breed makes a marked improvement when bred to the common sheep of the country, the first cross with a Cotswold ram often resulting in trebling the weight of the fleece, and at the same time greatly increasing the size and improving the form of the native stock; for this reason they are in great demand by those who, not having thoroughbred stock, wish to combine, as far as possible, both wool and mutton qualities in their flocks. They are also particularly valuable for crossing with the Downs and other short-wooled sheep.

Mr. Joseph Harris, the well-known breeder and agricultural writer, has found by experiment, that the cross produced by the use of the Cotswold ram on his Merinos has proved most satisfactory, and he highly recommends Cotswolds to those farmers who wish to produce a grade from a Merino flock.

The Cotswolds are considered by many breeders to be the hardiest of all the English breeds of sheep, as they are also the largest of all the well-established breeds.

The celebrated experiments of Messrs. Lawes and Gilbert have proved beyond doubt that the Cotswolds gain more rapidly, both in fleece and flesh, than any other breed, and also gain more in proportion to the food consumed than any other breed.

Description.—The Cotswold breed and the Leicesters are so nearly alike in external appearance, that to a novice in matters pertaining to sheep husbandry the distinction is difficult. The Cotswolds are larger, and usually have considerable wool upon the forehead, while the Leicesters have but little, being nearly bare-faced.

Gen. C. P. Mattocks, of Portland, Me., an extensive breeder and importer of thoroughbred stock, says respecting this point:

"In a Cotswold the inimitable foretop is an index of purity as well as of the wool-producing qualities. In fact the foretops in some of the best specimens of shearling rams are so heavy as to absolutely obscure the eyes, and remind one of the graceful foretop of a well-bred Morgan horse. Bare heads in Cotswolds should be discarded. There is a popular impression that a gray or mottled face detracts from the value of a Cotswold and is an indication of impurity, while many claim that sheep with such faces are hardier and better in all respects than the white-faced. Some of the best Cotswolds ever brought to this country were gray-faced. The sweepstakes ram of the St. Louis Exhibition of 1872, afterwards owned and successfully used by the writer, had a gray face. He reached the enormous weight of 445 lbs., and his offspring were worthy of him."

The following translation from a recent French publication of high authority contains a good description of this breed.

"From time immemorial, the hills of Gloucestershire, Eng., have been inhabited by a breed of rustic sheep, sheltered in winter beneath sheds, to preserve them from the severity of the climate of that pastoral region. It is from this latter circumstance that the breed takes its name (Cots–wold; *i. e.*, camp of sheep cots, or sheds).

Before the advent of Bakewell, these sheep were noted for the whiteness and fineness (relatively) of their wool. At the commencement of the 16th century, Camden described the numerous flocks of sheep raised upon the hills of Gloucestershire as furnishing wool of remarkable whiteness, and of very fine quality, much esteemed and sought after by foreign nations.

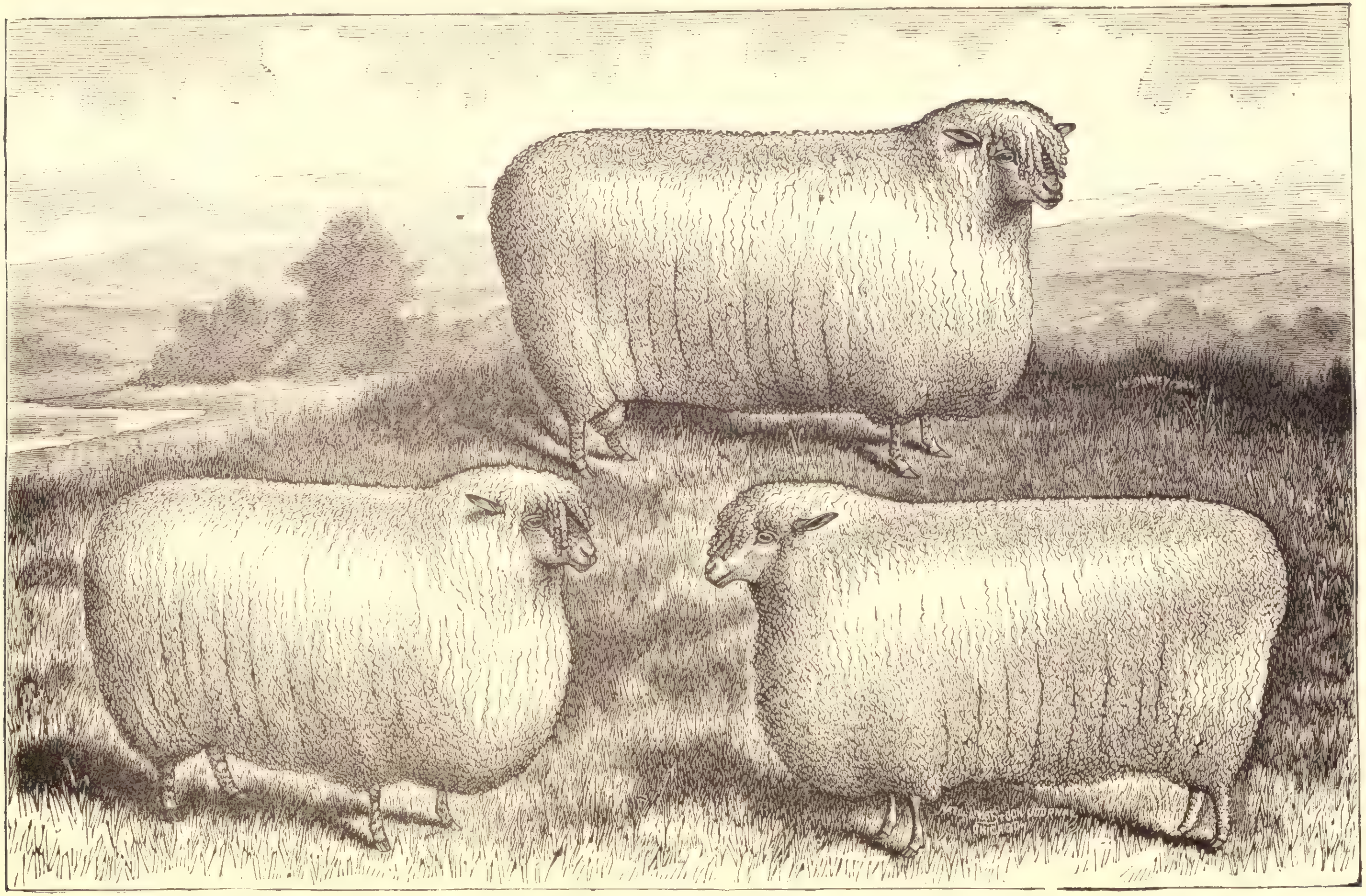
Typical Characteristics.—Forehead short, and not prominent; little prominence to the orbital arch; face long, slightly conical; the zygomatic crest prominent; lower jaw-bone has its branches close together, and rising again at an obtuse angle; the incisive arch large. In the living animal the muzzle is large and blunt; lips thick; mouth large; ear short, heavy, and falling to the front; head covered with wool to the rear of the orbital arch, and forming a point on the forehead; eye small, with upper lid drooping slightly.

Secondary Characteristics.—The wool of a remarkable whiteness—a whiteness which is not met with in any other breed—the hair long, smooth, and soft, forming locks that are pointed but curled; fleece more full than that of other long-wool breeds in general, extending under the belly, but not over the legs; stature very high; more robust than that of the Leicester breed; head relatively a little large; neck long, slightly formed, and puny; chest very large and prominent; shoulders strongly muscled; withers low and very thick-set; line of back slightly elevated; haunches well spread; rump long and pointed; hams rather lean; flank short; belly well rounded; body as a whole large, and in form of a parallelopiped, limbs well spread when the animal is standing. Notwithstanding the great development of skeleton, the aptitude for fattening is prominent. They are not so precocious as the Leicester breed.

As fattened for market, the Cotswold attains, commonly, a weight of eighty kilogrammes —(175 lbs.) Of the four lots exhibited at the International Fair at Poissy, in 1862, one, composed of five animals, only nine and a half months old, gave a total live weight of 532 kilogrammes—(1170 lbs.), which would be an average of 160 kils. 400 grammes per head,—134 lbs.) The oldest lot, twenty-one months old, weighed only 457 kils., or 91 kils. 400 grammes per head—(200 lbs.) The two other lots, of six and a half months old, and ten and a half months old, weighed—the first 387 kils., the second 486 kils.; an average of 77 kils. 400 grammes—(170 lbs.), and 97 kils. 200 grammes—(213 lbs.) When it is considered that these weights were of animals fattened for display, and brought directly from England, it will be remarked that the figure named for the average weight of the breed is no exaggeration.

The meat is of first quality, and esteemed above that of the New Leicester and New Kent breeds, although, like the latter, it may quite often be surrounded by the thick layer of fat before spoken of. M. Nouvais has truly said, one of the qualities possessed in a remarkable degree by the Cotswold "is that of accommodating itself to all varieties of climate and nourishment;" and adds, "this breed prospers upon the poor soil of the hills of Gloucester, and thrives equally well upon the rich pasturage of Leicester and Buckinghamshire." While increasing the fattening propensity, the breed has preserved, with its vigorous and rustic nature, the faculty of accommodating itself, more readily than any other of the English breeds, to the varying circumstances of agriculture and climate."

It is stated by good authority that flocks of Cotswolds will often average nine pounds of unwashed wool, and that this is a fair standard, below which they ought not to fall. Many of the bucks imported from England reach from 300 to 400 pounds weight. John Snell's Sons, of Edmonton, Ontario, Canada, state that they have bred Cotswold bucks that, at



COTSWOLD SHEEP, "ROYAL WINNER," "DUKE OF FYFIELD," "LADY GILLETT."

Property of John Snell's Sons, Edmonton, Canada.

eighteen months old, have weighed over 300 lbs., and have recently exhibited nine ewes of this breed that averaged 313 pounds each. They have also sheared on an average of an entire flock, over ten pounds of clean washed wool per head; but these results have only been reached after years of experience in careful breeding and large expenditures in importations.

The following is the standard of excellence and scale of points that has been adopted for this breed:

STANDARD OF EXCELLENCE AND SCALE OF POINTS FOR COTSWOLD RAM.

Head not too fine, moderately small, and broad between the eyes and nostrils, but with a short, thick appearance, and in young animals well covered on crown with long lustrous wool,	8
Face either white or slightly mixed with gray, or white dappled with brown,	4
Nostrils wide and expanded. Nose dark,	1
Eyes prominent, but mild looking,	2
Ears broad, long, moderately thin, and covered with short hair,	4
Collar full from breast and shoulders, tapering gradually all the way to where the neck and head join. The neck should be short, thick, and strong, indicating constitutional vigor, and free from coarse and loose skin,	6
Shoulders broad and full, and at the same time join so gradually to the collar forward and chine backward as not to leave the least hollow in either place,	8
Fore-legs.—The mutton on the arm or fore thigh should come quite to the knee. Leg upright with heavy bone—being clear from superfluous skin, with wool to fetlock, and may be mixed with gray,	4
Breast broad and well forward, keeping the legs wide apart. Girth, or chest, full and deep,	10
Fore-flank quite full, not showing hollow behind the shoulder,	5
Back and loin broad, flat and straight, from which the ribs must spring with a fine circular arch,	12
Belly straight on underline,	3
Quarters long and full, with mutton quite down to the hock,	8
Hock should stand neither in nor out,	2
Twist, or junction inside the thighs, deep, wide, and full, which, with a broad breast, will keep the legs open and upright,	5
Fleece.—The whole body should be covered with long lustrous wool,	18
Total,	100

STANDARD OF EXCELLENCE AND SCALE OF POINTS FOR COTSWOLD EWES.

Head moderately fine, broad between the eyes and nostrils, but without a short, thick appearance, and well covered on crown with long lustrous wool,	8
Face either white or slightly mixed with gray, or white dappled with brown,	4
Nostrils wide and expanded. Nose dark,	1
Eyes prominent, but mild looking,	2
Ears broad, long, moderately thin, and covered with short hair,	4
Collar full from breast and shoulders, tapering gradually all the way to where the neck and head join. The neck should be fine and graceful, and free from coarse and loose skin,	5
Shoulders broad and full, and at the same time join so gradually to the collar forward and chine backward as not to leave the least hollow in either place,	8
Fore-legs.—The mutton on the arm or fore thigh should come quite to knee. Leg upright with heavy bone—being clear from superfluous skin, with wool to fetlock, and may be mixed with gray,	4
Breast broad and well forward, keeping the legs wide apart. Girth, or chest, full and deep,	10
Fore-flank quite full, not showing hollow behind the shoulder,	4
Back and loin broad, flat, and straight, from which the ribs must spring with a fine circular arch,	12
Belly straight on underline,	5
Quarters long and full, with mutton quite down to the hock,	8
Hock should stand neither in nor out,	2
Twist, or junction inside the thighs, deep, wide, and full, which, with a broad chest, will keep the legs open and upright,	5
Fleece—The whole body should be covered with long lustrous wool,	18
Total,	100

Exceptions to the general rule are sometimes met, and a "black sheep" found in a Cotswold flock. Mr. Henry W. Rice of Bourbon County, Kentucky, raised quite a flock of pure-bred sheep from a black buck lamb, the progeny of a fine imported Cotswold ram and ewe of the same breed, both pure white, these black sheep possessing all the characteristics of the Cotswold breed except that of color. Mr. M. T. Hearne of Kentucky stated that he visited Mr. Rice and that he liked these black Cotswolds so well that he bought two ewes, and from them he has raised quite a flock, that are equal in every respect to the best white Cotswolds he has ever seen; one of them, a ram, having taken the first prize at Lexington, in 1860, over all others.

He continued to breed them during the war until 1864, when he sold out the entire flock, black and white, at from $10 to $15 a head; the black ones, during all the time that he owned them, selling for the most money. After the war, the negroes being liberated, the black sheep disappeared, as it was for the black wool they were so much sought, to make clothing for the negroes. This is only an additional instance of the fact so well known and recognized by all naturalists, that there will be occasional variations or "sports" in every department of nature, these being the exceptions rather than the general law.

LEICESTERS.

TO the noted English breeder, Mr. Bakewell of Dishley, in Leicestershire, belongs the credit of improving this breed, which was accomplished more than a century ago, he having commenced the experiment in 1755. So successfully were his experiments conducted that ultimately the rams of this celebrated flock commanded $15,000 as hire for a single season. To this breed the other long-wooled varieties are largely indebted for their improved form and aptitude to fatten.

The original Leicester upon which Bakewell commenced his experiments is said to have been an animal of large frame, heavy bone, and coarse-grained meat, with a flat-sided body, and large, rough legs. It was also a slow feeder, and late in reaching maturity, weighing from 100 to 120 lbs. when two or three years old. With respect to Mr. Bakewell's experiments a recent writer says:

"Seeing the necessity of obtaining, in addition to the fleece, the largest possible increase of flesh in proportion to the food consumed, in the shortest period of time, he bred by selection most persistently and skillfully for these objects. With these aims always in view, he chose with rare judgment, yet with a broad latitude as to breed or family, such animals as would approximate his ideal of compactness and symmetry, refinement of bone, a reduction of the proportion of unprofitable parts, and higher capacity for rapid conversion of food to flesh. After securing this result by animals of characteristics so widely differing from those of the original stock, he found necessary a rigid adhesion to the practice of in-and-in breeding to keep the advantage gained, until a fixedness of type had been secured which should impress itself surely and indelibly upon any race which might be selected for improvement.

In accomplishing results of such practical value, with all possible care to retain the sound constitution and great hardiness of the old stock, there was perhaps inevitably induced a comparative delicacy, a reduction in size, a decrease in prolificacy and excellence as nurses. These defects have demanded the widest judgment in the infusion of fresh strains of blood, by which the stamina of the race has been fortified, and its popularity maintained until the present day, to such a degree that the Leicester blood is far more widely diffused than that of any other breed, even modifying essentially all the long-wooled races, and to some extent the mountain breeds, and some families of the short-wool Downs."

The most marked feature in their structure is the smallness of their heads and bones generally, in proportion to the size and weight of the body. Their mutton is however maintained in a due proportion of lean meat, and is not considered quite equal to the Southdown and some other breeds. The fleece, on the average, weighs from six to eight pounds, the uniformity in the lustre of the wool making it quite popular with the manufacturers of alpacas, and other glossy-surfaced goods. It is not considered however quite as hardy as some breeds, although found in the climatic extremes of Canada and the cotton growing States. As a general rule the climate of the north is too severe for them, and a hardier race will be found more profitable to farmers of that portion of the country.

They are quite numerous in Virginia, Kentucky, and Tennessee, and some of the Middle and Ohio Valley States, but are not as numerous and popular in this country generally as the Cotswolds. The earliest record of this breed in the United States is a mention of them by Curtis, in writing of the Bakewell ewes on the estate of Washington, from which were derived the somewhat famous Arlington long-wooled sheep.

Border Leicester Ram,
Owned by Lord Polworth, Berwickshire, Scotland.

The Leicesters are reputed to be less prolific than some breeds, twins being of rare occurrence in the flocks.

Border Leicesters.—This variety is considerably larger than the improved Leicester, which is supposed to be due to the introduction of Lincoln or Teeswater blood. They are similar in general characteristics to the Leicesters, the wool also being about the same value, but are recognized as a pure and distinct breed at Agricultural Shows in England, where prizes are offered. They are highly esteemed in the border counties, and south of Scotland. Mr. Wilson, Member of Council, Highland and Agricultural Society of Scotland, thus describes the breed:

"The most marked feature in their structure is the smallness of their heads and of their bones generally, as contrasted with their weight of carcass. They are clean in the jaws, with a full eye, thin ears, and placid countenance. Their backs are straight, broad, and flat;

the ribs arched, the belly carried very light, so that they present nearly as straight a line below as above; the chest is wide, the skin very mellow, and covered with a beautiful fleece of long, soft wool, which weighs, on the average, from six to seven pounds. On good soils, and under careful treatment, these sheep are currently brought to weigh from eighteen to twenty pounds a quarter at fourteen months old, at which age they are now generally slaughtered. At this age their flesh is tender and juicy, but when carried on until they are older and heavier, fat accumulates so unduly in proportion to the lean meat as to detract from its palatableness and market value."

LINCOLNS.

THIS breed was originally from Lewes, Lincolnshire, England, and was formerly characterized by very large size, coarse and ungainly forms, with an immense fleece of very long wool, it often weighing from ten to twelve pounds. It has, however, been greatly changed for the better by crossing with the Leicesters, and is now, in fact, a sub-variety of that breed, the wool retaining mostly its original characteristics, which are length of staple, and a peculiar lustre which adds much to its value. They do not mature as early as the Leicesters, but are considered a valuable breed. The mutton contains less fat and a greater proportion of lean flesh than the Leicesters.

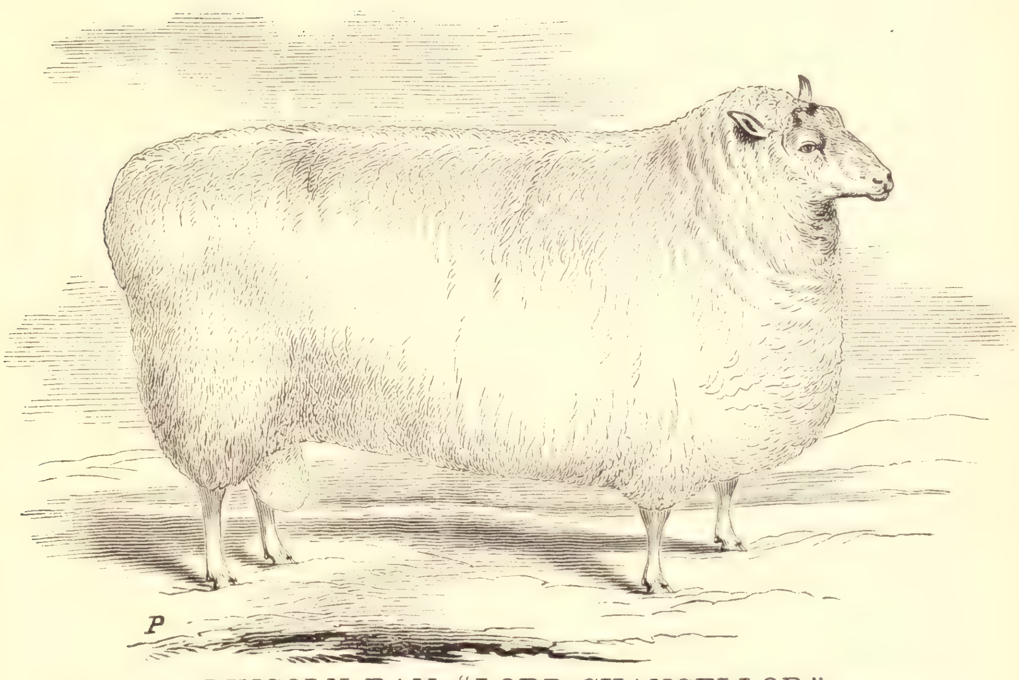
Mr. Richard Gibson, of Ilderton, Ontario, Canada, who has had many years' experience in breeding this variety, says:

"Lincolns have always been noted for producing the heaviest fleeces of combing wool of the very finest quality, but at the same time were a large, coarse, slow-maturing sheep, requiring rich pastures and from three to four years to fully develop, but were then monsters in size. But within the past seventy-five years there has been a great improvement in all varieties of sheep, but with none of the long-wool varieties perhaps as much during the last thirty years as with the Lincolns, and no variety of long-wooled sheep in England has made more rapid strides, in the general estimation of the tenant farmer, or extended their territory farther. They are now to be found in nearly every portion of the globe, and especially in the colonies of Australia and New Zealand are they in favor, no cross answering as well on the common flocks of the country.

When we consider the great advance that has taken place in all branches of agriculture of late years, and the prominent position that sheep have occupied in the general economy of Lincolnshire farming, we can readily understand the incentive and, in fact, the necessity of improvement in the sheep which might be called indigenous to that part of England. As the general aspect of the country changed, and what was formerly barren wastes and rabbit warrens gradually became one of the most productive and best cultivated portions of Britain, and as this great change has been due to the cultivation of green crops, and feeding them off by sheep, we can readily see that the old Lincoln, requiring three years to mature, was not suitable for the purpose.

There can be no doubt but that to the Leicesters, in a great measure, must be given the credit of having been instrumental in remodeling a variety that now beat their improvers in all points of practical value. We find that ninety years ago Mr. Dudding, of Panton (grandfather of the present eminent breeder of that name), was one of four Lincolnshire farmers to pay the Bakewell Club one thousand guineas ($5,000) for the use of a ram one season. It is also recorded of another Lincolnshire farmer paying Mr. Bakewell one thousand guineas for the hire of two rams one year.

LINCOLN EWES.
Property of Richard Gibson, Ilderton, Ontario, Canada.



LINCOLN RAM, "LORD CHANCELLOR."
(Two years old.) Imported by and the property of Richard Gibson, Ilderton, Ontario, Canada.

But it is not to the cross alone that we must give all the credit, or by this time there would have been no Lincolns, as they would have merged into Leicesters; but the greater credit is due those breeders who had the sagacity to use the cross in such a manner as to retain all the good qualities of the old Lincoln, and only absorb or make use of such as were desirable for their purpose from the Leicester, without destroying the original type and introducing certain traits which would have been of no use, but certainly detrimental. It may be stated that one of the main objects to be kept steadily in view by these improvers was to establish a breed having the fine-feeding and early-maturing propensity of the Leicester, so as to suit the wants of the 'wold' and 'heath' farmers, who, owing to the nature of their occupancy, must have sheep to 'go off' at about twelve or fourteen months old, and at the same time retain the strong constitution and vigor of the old Lincoln, so as to suit the purposes of the marsh and fen farmers. To these must be added the adaptability of being kept in large flocks, and quickly maturing under ordinary farm management; lastly, to retain their powers of growing heavy fleeces of fine-lustred wool. As to early maturity, at the Smithfield Club Fat Cattle Show the Lincolns are the heaviest sheep exhibited. In 1870 the prize pen of three wethers about twenty-two months old averaged 328 lbs. each; the next heaviest were Cotswolds, 307 lbs. each. In 1871 the pen of Lincoln wethers not only took first in their class, but also the £20 cup for best pen of long-wooled sheep, and the £50 champion plate as best of any age or breed in the show, weighing twenty-three pounds per head more than the first-prize Cotswolds. Mr. Byron's prize pen of ewes averaged 346 lbs. each. In 1872 the Lincolns again won first prize for best pen of wethers in long-wool classes, averaging 312 lbs. each; the first-prize Cotswold weighing 289 lbs. and Leicesters 236 lbs., while Mr. Pears' first-prize pen of ewes averaged 322 lbs. At the last Smithfield show the Lincoln ewes were the heaviest sheep exhibited. But a better proof of their early maturity may be seen at the Lincoln April Fair, where from 60,000 to 100,000 sheep are annually penned for sale on Friday, mostly 'hoggets,' as they are termed, from twelve to fourteen months old (a term applied to a sheep after it has passed its first year). They are brought there for sale by the heath and wold farmers, and sold in their wool. Many of them are purchased by the graziers in various parts of the country, but most are bought by the marsh and fen farmers, who, owing to the nature of their farms, cannot keep a breeding flock. We have known whole flocks of the 'hoggets' to clip eleven pounds washed wool, and average 100 lbs. dressed mutton.

Mr. Robert Smith, in his report of the Royal Show, at Marwick, describing the Lincolns, states that he has known fourteen months old lambs averaging 35 lbs. per quarter (140 lbs. dressed mutton), and a hundred together clipping 14 lbs. washed wool each.

Mr. T. Marshall reserved for use in his flock three shearling rams of his own breeding, which averaged 317 lbs. each, the heaviest weighing 334 lbs.

Again, Mr. Chas. Howard says: 'Mr. Dawson killed a three-shear sheep weighing 96½ lbs. per quarter (386 lbs. of mutton), a two-shear weighing 91 lbs., and a shearling 71 lbs. per quarter.'

Many more instances might be quoted of their early maturity, but these excessive weights are often secured regardless of expense, and merely as a matter of boasting. But such is not the case at Lincoln April Fair; the sheep there seen are all penned by farmers who have to pay their rents out of their flocks, and it is with them an actual matter of dollars and cents.

That they are a healthy, vigorous breed may be gathered from the fact that a portion of their native country (the marshes and fens) is very wet and low lying, having been reclaimed from the sea. Some portions of this reclaimed land are sixteen feet below the level of the sea, and yet these sheep are grazed here in immense numbers, and some of the finest specimens we have ever seen were on these wet soils. In a lecture on long-wooled

sheep, delivered before the Royal Agricultural College by Mr. J. Algernon Clarke, when speaking of Lincolns, he says:

'It is certain that neither Cotswolds or Leicesters, in cases where they have been tried, (in that district), have equaled the Lincoln in value of wool and mutton, together produced per acre, and no other breed can furnish such big and heavy-skinned "lamb hoggets" as are the grazier's attraction at Lincoln, Caistor, and Boston spring fairs.'

As to their adaptability of being kept in large flocks, the Messrs. Dudding keep a breeding flock of 800 ewes, and clip about 1,400 head. Numbers of other farmers can be named having from 600 to 1,000 ewes, which means a flock of from 1,500 to 2,500 head to be wintered. As to whether they have retained the power of growing heavy fleeces of lustred wool, the Farmer's Magazine states that the first prize three-shear exhibited at the Lincoln meeting of the R. A. S. E. girthed 5 ft. 8 in., and had cut in his three fleeces 51¾ lbs. of washed wool.

In a lecture delivered by Mr. Charles Howard at the Central Farmer's Club, he mentions a case of 327 Lincoln 'hoggets' producing 3,640 lbs., an average of over 11 lbs. washed wool.

Mr. J. A. Clarke also states two instances, one where 257 fleeces weighed 3,276 lbs., or an average of over 12½ lbs. each; the other, where a clip of 2,829 fleeces averaged 11 lbs. each. Mr. Dudding writes 'Our flock numbers about 1,400, and the average clip is from ten to twelve pounds each; our ram "hogs" shear from 15 to 20 lbs. The two you saw at Spalding (with two years' growth of wool), we clipped to-day; the first one cut 33 lbs., and the other 40 lbs.; length of staple 30 inches.'

Mr. Marshall writes us: 'Our ram "hoggets" cut from 15 to 22 lbs., and I have had as much as 26½ lbs. from one."

Much more evidence to the same effect might be adduced, but the above is sufficient for the purpose.

The above is not written with the intention of glorifying one breed at the expense of another, and we do not wish to be understood as asserting that the Lincolns are adapted to all portions of our country, but there are certain districts where we firmly believe that they will pay a better percentage than any other variety. We would not advocate their displacing the small, active Merino in the far West, nor the Merino and 'Downs' in certain portions of our rough, mountainous Eastern States, but it may be laid down as a broad rule, wherever Short-horn cattle will grow to perfection, there you may keep the Lincoln to advantage; neither of them like to work over-hard for their living; but wherever they can get a good bite and satisfy their appetites without too much exertion, there will the Lincolns pay to keep as long as combing wool is in demand and mutton eaten. We prefer them to the Cotswolds because they will cut a heavier fleece of a more valuable grade of wool, and will stand rough treatment better; to the Leicester because they have better constitutions, are not liable to lose their wool on the belly, neck, and arms, produce a heavier fleece, and because they are a better mutton sheep, having more lean meat, and the fat not deposited in large masses on the outside of the carcass; and to either of them, as being better adapted to the ordinary wants of our farmers, since they will make a better return in the shape of wool and mutton combined, for the amount of food consumed, than any variety of long-wool sheep with which we are acquainted. And lastly, we believe they will make a better cross on the common sheep of the country than any other that can be used."

CARAMAN OR FAT-TAILED SHEEP.

THERE are many varieties of the fat or broad-tailed sheep, and among naturalists generally they form a group by themselves. They are found in Asia and Africa,—being abundant at the Cape of Good Hope,—also in some portions of Europe. The tail in some of these varieties weighs from fifteen to twenty pounds, but among some of the larger kinds has been known, when well fattened, to reach the enormous weight of seventy, eighty, and in rare cases, according to the best authority, even as high as one hundred and fifty pounds; this overgrown appendage often being of great inconvenience to the animal. The Syrian breeds have it less developed than most of the others. It consists of an oleaginous or fatty deposit, said to be of a consistence between fat and marrow, very palatable when the animal is young, being often used by the inhabitants of these countries as a substitute for butter.

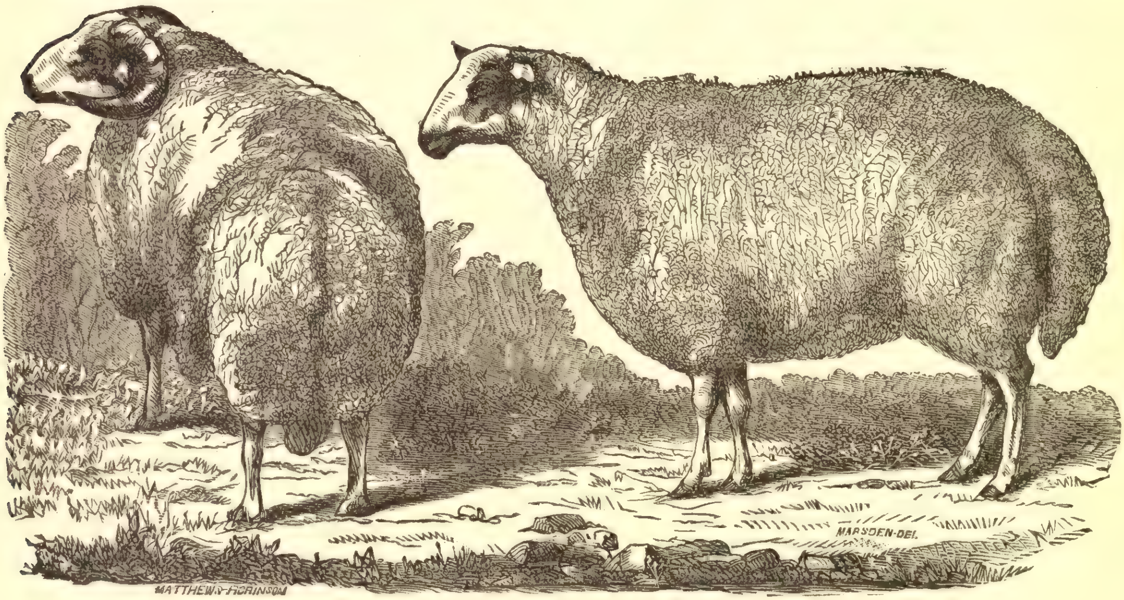
This appendage is often so cumbersome that in order to relieve the animal from dragging or carrying it about, and at the same time protect from injury what is considered the most valuable part of the mutton, and a great delicacy, a rude cart or truck is often placed under it as shown in the following figure, and which causes them to present a most ludicrous appearance. In the countries where these sheep are raised extensively, it is no uncommon sight to see them dragging about their little carts, with their much prized freight.

FAT-TAILED SHEEP WITH GO-CART.

These sheep are rather small and their wool somewhat coarse in texture. They are supposed to be the varieties which were bred by the patriarchs and their descendants, the Jewish race. This inference is founded upon various passages in the Bible, among which are Exodus xxix. 22; Leviticus iii. 9; viii. 25; where "the fat and the rump" are referred to in reference to offerings. Allen says respecting these varieties or families of sheep: —

"This breed consists of numerous sub-varieties, differing in all their characteristics of size, fleece, etc., with quite as many and marked shades of distinction as the modern European varieties. In Madagascar, they are covered with hair; in the south of Africa, with coarse wool; in the Levant, and along the Mediterranean, the wool is comparatively fine; and from that of the fat-rumped sheep of Thibet, the exquisite Cashmere shawls are manufactured. Both rams and ewes are sometimes bred with horns, and sometimes without, and they exhibit a great diversity of color. Some yield a carcass of scarcely thirty pounds, while others have weighed two hundred pounds, dressed. The tail or rump varies greatly, according to the purity and style of breeding; some are less than one-eighth, while others exceed one-third the entire dressed weight. The fat of the rump or tail is considered a great delicacy, and in hot climates resembles oil, and in colder, suet. The broad-tailed sheep were brought into this country about seventy years since, by Commodore Barron and Judge Peters, and bred with the native flocks. They were called the Tunisian Mountain sheep. Some of them were subsequently distributed by Colonel Pickering, of Massachusetts, among the farmers of Pennsylvania, and their mixed descendants were highly prized as prolific and good nursers, coming early to maturity, attaining large weight of superior quality of carcass, and yielding a heavy fleece of excellent wool. The lambs were dropped white, red, tawny, bluish, or black; but all excepting the black grew white as they approached maturity, retaining some spots of the original color on the cheeks and legs, and sometimes having the entire head tawny or black. The few which descended from those originally imported into this country became blended with American flocks, and are now scarcely known. A few other importations have since been made, but have proved of little value for American cultivation "

The accompanying representation was taken from specimens of this breed imported from Karamania, in Asiatic Turkey, by W. W. Chenery of Highland Stock Farm, Belmont, Massachusetts. It is stated on the best authority that the fat-tailed sheep of the Kirghis, after being bred for a few generations in Russia, will lose this peculiar characteristic that had before distinguished them.



CARAMAN OR FAT-TAILED SHEEP.
Owned by W. W. Chenery of Belmont, Massachusetts.

Dorsets.—This is a very ancient breed of sheep found in the country of Dorset and vicinity, England. They are a hardy race, and resemble the Merino in general form, but in no other respect. They are particularly distinguished for being prolific, and are valuable for supplying early lambs for the market, as the lambs dropped in October are ready for table use at Christmas. This early breeding and prolific tendency are what have prevented the extinction of the breed, as they are otherwise not particularly valuable. They have even been known to produce lambs twice in the same year, and have long been used for supplying the London market. They are a white-faced horned sheep, with wool of medium quality, weighing about four pounds per fleece; are quite robust, and will subsist on scanty pasturage better than many breeds. Some varieties of the breed have a tinge of dun in the face and legs, but are usually pure white.

Cheviots.—This breed is found mostly in the hilly border counties between England and Scotland, and are a very hardy race. In general appearance they somewhat resemble the Border Leicester. The wool belongs to the middle class, and is used for the manufacture of goods commonly known as "tweeds." The best quality of this wool is said to be produced from dry, sweet herbage.

Black-Faced, or Heath Breed.—These sheep belong to the mountain breeds of England, and are found in the mountainous parts of Yorkshire, Lancashire, Cumberland, etc., and the Highlands of Scotland. Both rams and ewes have horns, those of the former being very large and spirally twisted. They have nothing of the russet or brown color that distinguishes the Down family, the face and legs being either black or specked with black, with an occasional tendency to this marking on the fleece. They are an extremely hardy race that could not well be dispensed with in their locality, or their place substituted by the more improved breeds, as they are capacitated to endure cold and hunger, getting a fair sub-

sistence on the rough mountain pasture, where the more delicately constituted improved breed would utterly fail. They will often pick up a scanty subsistence beneath the snows in the severe winter season. Their chief defects are in the quality of their wool, which is very coarse, and the slowness of fattening until their full growth is attained. Their wool is often mixed with kemps or hairs, which detracts from its value; it is also quite uneven and is used for carpets and coarse cloths, and weighs about three pounds per fleece.

Cross Breeds and Grades.—Some of the best breeds now extant have been obtained through judicious crossing, such as the Oxfords, for instance, produced by a cross between the Cotswold, Southdown, and Hampshire Down, besides various other valuable breeds that might be mentioned as the result of intelligent and painstaking effort in the improvement of stock of different kinds.

Experiments in this direction are often resorted to by farmers, when the results fail to be satisfactory, inasmuch as they may fail in selecting those individuals of their flock possessing the qualities adapted to the best results from a lack of knowledge and experience in the art of breeding, and also from expecting too marked results in a short time.

It must be remembered that some of the best efforts in establishing a breed possessing a fixed type, and the power of repeating or reproducing uniformly its most desirable characteristics, requires the labor of a series of years, or almost a lifetime of unremitting skill and perseverance, and with the main points to be reached and the well-defined object to be attained constantly in view. And when the establishing of a valuable breed has been accomplished, it must be kept pure and free from the intermingling of other blood, in order to be kept up to the highest standard of excellence. We are greatly indebted to the patient perseverance of skillful breeders of years past as well as the present, for the valuable breeds we now have.

Hon John L. Hayse, Secretary of the National Association of Wool Manufacturers, says: "The breeding of animals is now recognized as among the greatest of the creative arts. Professor Agassiz says enthusiastically of the stock breeders of the present day: 'The practical realization of a theoretical acquisition has led them to make science the foundation of their business. From very empirical workmen they have raised themselves to be a class of thinking workers, who, as regards mental range, will very soon surpass every other industrial class, and before long will give society a totally new impress.'

No class of stock-growers have done so much to merit this high praise as the breeders of sheep. This species being so plastic in its character that the breeder, according to Lord Somerville's celebrated saying, 'may chalk out upon a wall a form perfect in itself, and then give it existence,' presents the most signal illustrations of the modern doctrine of evolution. The breeder has become a veritable creator. The products of his art have the permanency of primeval species. There are convincing reasons for believing that the precious Merino was converted by the art of man from the coarsest of the primeval sheep, the hair being dropped, and the underlying down, found still in the rudest of the ovine races, having been developed into fine wool. All the most valuable long-wooled races of England, so distinct in their characters, have been developed by human agency. The Merino of Spain has been converted on the one hand to the electoral race of Germany, and the sheep Naz of France; producing fleeces of the utmost fineness, but weighing not more than a pound and a half, and with a length of fibre of less than an inch; and, on the other, to the Rambouillet sheep, producing fleeces of thirty pounds weight, with a length of five inches.

New and unexpected qualities appear from time to time through accident, which the breeder turns to advantage, such as the silky Mauchamp wool, rivaling the Cashmere, or even modifications of the skeleton form of the animal, as in the Ancon or *otter* sheep of Rhode Island, with limbs so formed that it cannot jump fences. A new attribute attained by the

breeder's foresight, or his judicious application of happy accidents, may be of priceless value. Thence the immense money value of the best stock sheep—a value enhanced by the rapidity with which the regenerating influence of the male propagates itself. The influence of one buck in three or four years may raise the wool product of a flock of a thousand sheep from five to ten pounds for each individual.

There are cases which justify this statement. Thus, even in the time of the Emperor Tiberius, Spanish rams were sold for a talent—about a thousand dollars of our money. The ram-letting of two animals by Bakewell, the producer of the new Leicester sheep, produced in one season twelve hundred guineas. Our Mr. Hammond sold his bucks for five thousand dollars each; and even in Australia, where perfection in sheep-breeding might be supposed to be everywhere prevalent, a ram at a sheep auction in Melbourne, during the present year, 'after the keenest competition, was knocked down at three hundred and fifty-five guineas.'

In the history of agriculture no names stand so prominent as great benefactors as those of Robert Bakewell, the creator of the new Leicester; John Ellman and Jonas Mills, the improvers of the Southdowns; Von Thaer and the Duke of Lecknowsky, in Germany, the improvers of the Merinos; Daubenton, the associate of Buffon, the founder of the French Merino; Mr. McArthur, the creator of the Australian sheep husbandry; Edwin Hammond, of Vermont, mainly the originator of the American Merino. The nobility of sheep-breeding is recognized in all the advanced nations. The Empress Eugenie took the flock of Rambouillet under her special protection. The Queen of England takes special pride in the choice flocks which adorn her parks. The English nobleman values the prizes for his perfected Southdowns or Lincolns above all the honors of the turf. And, at a dinner of the landed gentry, the topic of sheep and turnips takes precedence of all other table talk. Such recognitions lift the creative work of the sheep-breeder to the rank of the highest of the arts of agriculture, and make its acquisition not only a source of national emolument, but an object of national pride."

We believe that the thoroughbred stock is best, and that no cross-breeds will equal them, although for special purposes, such as the combining of the qualities of both breeds to a certain extent, whether it be mutton or wool qualities, very good results can often be obtained.

In changing the standard of a flock of sheep, by crossing or grading, marked results will often follow in a very short time, and a Merino, or even what are called 'scrub sheep,' can, by proper management and care, be changed into an almost pure-blooded Southdown, Cotswold, or any other breed.

The grades produced by improving in this way the common or native sheep are valuable, and this will be the best course for a farmer to pursue who has a native flock and does not possess the means of procuring the more valuable thoroughbred breeds. In such cases great care should be observed in procuring bucks of the very best quality, remembering that the general law of nature that "like begets like" is quite a reliable one, and although there may be exceptions, it is the safest to follow, and that the use of the BEST in this department, as well as almost every other, is the most profitable eventually.

A grade buck should never be used in a flock of thoroughbred ewes, as it will cause the flock to degenerate. Such is the inevitable result, and the progress of degeneracy will even be more rapid in such cases than that of improvement in a flock of common "scrub" sheep when thoroughbred bucks are used. Although in general appearance a grade buck may closely resemble the thoroughbred, and but little difference, if any, can be detected — and in fact lambs that are the product of grade ewes and thoroughbred bucks often show nearly if not quite as much quality as the thoroughbred rams, still they will not transmit this quality with any degree of certainty to their progeny; hence it is necessary that the *pure blood* be used for this purpose, whether the farmer's aim be wool, or mutton, or the combination of both.

The choice of breed for crossing or grading depends mainly upon the object desired. If fine-textured wool be the principal object, a Merino ram would be the breed recommended; if the demand be the longer-stapled wool of the combing variety, it would be a Cotswold, Leicester, or Lincoln, some of the Cotswold-Merino grades producing not only valuable wool in large quantity, but also very choice mutton, in this manner selecting the breed that combines the greater number of qualities desired for the purpose in view.

Mr. Joseph Harris, author of "Harris on the Pig," thus gives an account of his experience in crossing Merinos and Cotswolds:

"Starting with a flock of sixty common Michigan Merino ewes, and using a pure-bred Mapleshade ram, I got seventy-three lambs from the sixty ewes, and raised seventy-two of them. The ram lambs I sold to the butcher. The ewe lambs, at the proper age, were bred to a pure Cotswold ram, and the ewe lambs from this second cross, at the proper age, were bred to a pure Cotswold ram. The lambs so obtained have 87½ per cent. of Cotswold blood. The next, a fourth cross, of which I have only a few, contain 93¼ per cent. of Cotswold blood. Four crosses is as far as I have gone, though I propose to continue this method of breeding, using in all cases a pure-bred Cotswold ram.

I am a breeder of pure Cotswolds, and am an enthusiastic advocate of them. But there are many who think that 'like produces like,' and they select accordingly. Said an experienced fine-wool sheep breeder, a few days since, in looking over my flock: 'If I wanted a ram, that is the one I would select,' and he pointed out one of the *Cotswold-Merinos.* 'I would rather have him than any two of your thoroughbreds.' The *fact* that this splendid grade ram was obtained by using a *thoroughbred* had no weight with him. I believe he is wrong. I believe we should always use good thoroughbred sires.

The *first-cross* sheep have fine, close fleeces, somewhat resembling Southdown, but finer. The wool is in great demand.

The *second cross* varies somewhat. Some of the lambs look exactly like pure-bred Cotswolds. All of them have wool long enough for combing, and all are remarkably vigorous, handsome, well-formed, healthy sheep. I showed a second-cross yearling ewe at the fair this year that was 'as pretty as a picture" — a strong, square, short-legged, full-bodied sheep, with long wool, a beautiful head, and handsome foretop — in fact, a model Cotswold in everything but pedigree. I have another *two-cross* ewe that I exhibited in 1877. She sheared 13 lbs., and weighed, in breeding condition, at two years old, 237 lbs.

The *three-cross* lambs are, in everything but pedigree, Cotswolds. If I was going to exhibit at a fair a pen of the three best lambs, or two-year-olds, without regard to the breed or breeding, I should select from these grades two or three cross lambs or sheep.

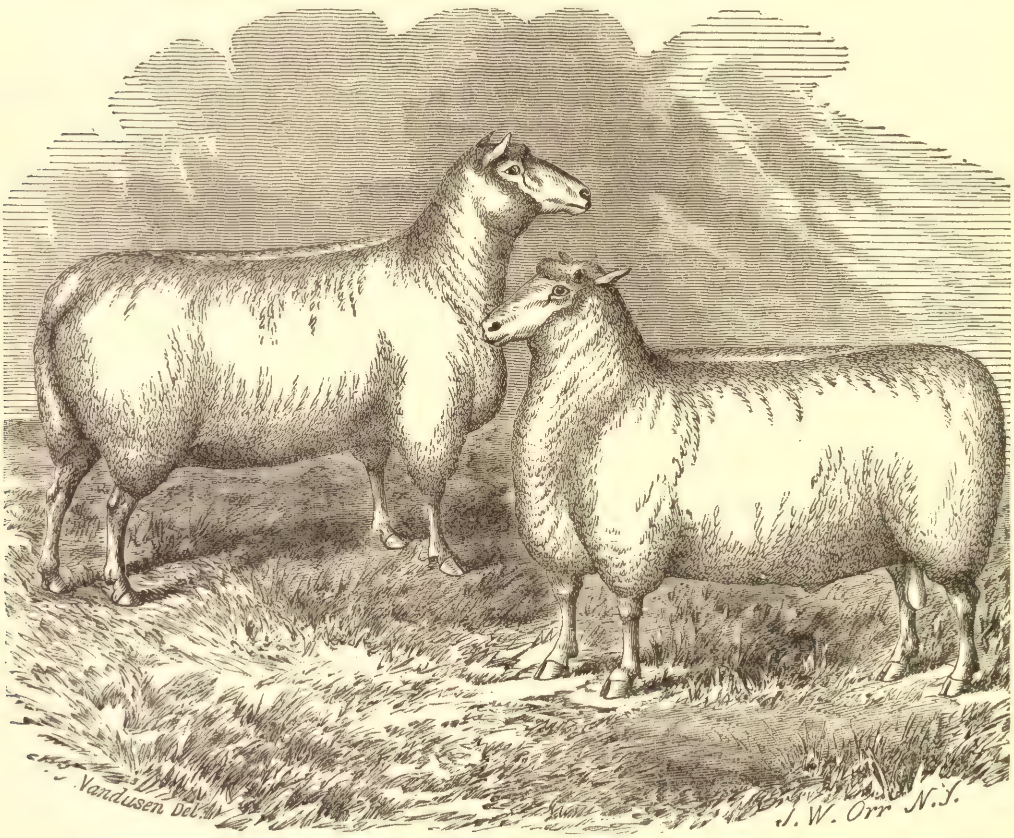
One word in regard to lambing. Many farmers seem to fear that if they put a large Cotswold ram to a small Merino ewe there will be trouble at lambing time. So far as my experience goes, their fears are groundless. We have never had the slightest trouble. A well-bred Cotswold has a small head, and it is the size of the head, and not the weight of the lamb, that causes trouble in lambing. We frequently have had lambs from common Merino ewes weighing 12 lbs. at birth, and in some instances 14 lbs. — and this from ewes weighing not over 80 lbs. — and yet we have *never* had any trouble in lambing.

The real secret of success in raising Cotswold-Merino lambs is to feed the Merino ewes a little better than common during the winter, and after lambing to feed them *as well as you know how.* A small Merino ewe cannot produce a 14-lb. lamb and give it all the milk it requires till it weighs 75 lbs., unless she has something to eat."

Mr. Killebrew, of Tennessee, says respecting grading a flock of common sheep:

"There are other considerations, important to the breeder just beginning to grade up his flock, in addition to their mutton qualities, even if mutton is his principal object. He wants long-lived and healthy ewes, and he wants them to yield him as much wool each year as

possible without detracting from their value as mutton. Remember, we are speaking of a grade flock now, with no thoroughbreds except the rams that are used. No better cross can be first used on the common ewes, it matters not what quality is most desired, than a Merino ram. It will add from one to two pounds of wool to each lamb, and will give a healthy and thrifty flock of half-breed ewes to breed from. With these to start on, it is an easy and pleasant task to shape the flock as desired. If a longer staple, a heavier fleece, and a larger carcass are desired, then a Cotswold ram should be used until the desired standard is reached; if, on the other hand, mutton is the object, use a Southdown ram on the half-breed Merino ewes. Either of these objects, wool or mutton, can be bred on a flock quicker by using direct on the scrub ewes a ram of either of the breeds mentioned, but in doing this we would get the hardy



IMPROVED KENTUCKY SHEEP.

Bred by Col. Robert W. Scott, Frankfort, Ky.

and valuable blood of the Merino, a cross that would certainly be of benefit to every grade flock. A most valuable and desirable grade sheep, and one that comes probably nearer than any other filling all the requirements of the average farmer, is to breed the half-bred Merino ewes in twice to a Cotswold ram, and then on the ewes from these crosses breed a Southdown ram. In the first cross with the Merino we get more fleece of finer quality, a long-lived, healthy sheep. Such ewes, bred to a Cotswold, will nearly double the weight of fleece, giving it more length, and at the same time increasing greatly the size of carcass. Breed these Cotswold-Merino ewes to a Cotswold ram again, and the produce will approach very near a full-blood Cotswold in size and appearance. The fleece will not be quite as long or heavy as the Cotswold, but it

will be of finer texture, owing to the Merino cross. The ewes can be counted as valuable breeders at seven or eight years of age, and will, in their prime, average a clip of eight pounds of wool. The breeder can keep his flock up to this standard by using every third year a Merino ram on the ewes. The sale of early lambs, however, will be the chief source of revenue to him, and, in order to realize the best prices, a Southdown ram should be used for the sire of the market lambs.

The effect of breeding a Southdown ram on these Cotswold-Merino ewes will be of no advantage to the fleece of the offspring; on the contrary, it will have a tendency to decrease the weight and length; but the change in this respect is scarcely perceptible, and the advantages arising from this cross for mutton more than compensate for the loss in wool. The lambs from the Southdown ram will be of more compact form, mature earlier, and take on fat more readily than the Cotswold-Merino lambs. Ninety per cent. of them will have the distinguishing marks of the Southdown, in brown faces and legs This adds nothing to their real value as mutton, but it assists the breeder very materially in disposing of them at the highest market price. This will be more readily understood by those who have experience in selling lambs, and know the very decided preference butchers give lambs that show their Southdown origin in black or brown faces and legs. Aside from the advantages mentioned above, a grade flock bred in this way are, owing to the constant infusion of fresh blood necessary to keep up the proper standard of the flock, remarkably healthy and vigorous."

The Oxforddowns, though comparatively but recently introduced into this country, have been found very valuable in crossing with the common sheep, as they readily transmit their valuable qualities, rendering the fleece heavier and increasing the size of the carcass, besides rounding it out in the more desirable points.

Respecting the improvement of breeds, Col. Robert W. Scott says: "The sheep which are called 'native,' or 'common,' in the West, are a hardy and prolific variety; but they are deficient in size, in thrift, and in fleece. Though the general diffusion of them proves their adaptation to the circumstances in which they are placed, yet it is well known that the tendency which all animals have to adapt themselves to climate and subsistence may be materially modified and controlled by judicious crossing, and that the improvement made by these crosses becomes permanent, and thereby stamps distinct varieties of the same class of animals. Chiefly by these influences (crosses, climate, and subsistence) the Bakewell, Oxfordshire, Saxony, Cotswold, and other varieties of sheep have been produced; and their distinctive features, in congenial localities, are as indelible as those of the stocks from which they were produced. In the same manner, no doubt, still other varieties may be produced; nor does there appear to be any insuperable difficulty in blending, in the same animal, any number of valuable qualities which are not actually antagonistic to each other. These principles extend even to points of fancy merely. For example, some breeds of sheep are hornless, while others have two, three, and even four horns. The Syrian shepherd delights in a breed whose tails are so long and fat that wheels are required on which to draw them over the pastures; but we prefer sheep with short tails, and perhaps a breed might be produced as destitute of them as are dogs of some breeds.

There are other important considerations which make the frequent crossing of sheep desirable, if not indispensable. Dr. D. H. Dadd says: 'It is now a well-ascertained fact that health and vigor can only be perpetuated by not running too long on the same blood. The best variety of sheep I have ever known (putting fineness of fleece aside) was the mixed Bakewell and Southdown.' Sir Robert Smith, in his prize essay for the English Royal Agricultural Society, says: 'Having tried experiments in every possible way, I do not hesitate to express my opinion that, by proper and judicious crossing through several generations, a most valuable breed of sheep may be raised and established.'

The tendency of all improved breeds of all domestic animals to relapse to their original

status, when they are neglected or abused, is no proper discouragement to this course of improvement; for such a policy would condemn the adoption of all our best breeds of horses, cattle, sheep, and hogs; for all have been produced by careful and judicious crossing and selection, and all improvements in stock can be fully maintained only by a reasonable share of the same care and judgment by which the improvement was originally effected."

By studying the characteristics of the different popular breeds, and their adaptation to his own particular locality, and other requirements, such as the soil, quality of pasturage, climate, etc., whether wool or mutton, or both combined, be desired, the farmer can readily decide which are best adapted to his own use, either for grading the common native flocks, or for maintaining the more valuable thoroughbred standard.

Which Breeds are Best?—As to which breed among the many valuable ones is best in an abstract point of view, and can be unerringly recommended for all parts of our country for all general requirements, we are of the opinion that there is really no best breed. Some are best for certain localities and purposes, and some for others; each of the choice breeds is best in a general and special sense, in its appropriate locality and under appropriate management.

The more hardy and vigorous breeds are best adapted to extremes of climatic influences and the more scanty pasturage, while those more delicately constituted will thrive best and be found most profitable, in temperatures suited to their capacities; the mutton and wool qualities of the different breeds vary accordingly.

Each breeder will have his favorite among the different varieties, and will contend that his own is the one to be preferred above all others. In making a choice among the standard breeds, the farmer will be required to study the characteristics of each, taking into consideration the conditions and circumstances governing his own locality, his object in the enterprise, and be governed accordingly. The furnishing of early lambs for market purposes will be found an important item in profitable sheep-husbandry to those farmers who are so located as to have a ready and easy access to a city market.

Breeding Sheep.—With sheep, as with all other animals, the general principle of the prepotency of the thoroughbred male, and the uncertain and generally unprofitable results of the use of grades, is an important truism; therefore, in all efforts towards the improvement of a flock in breeding, the sire should be a thoroughbred animal. A thoroughbred male will be sure to impress his own valuable qualities upon his progeny; any slight deviation from this being the rare exception, rather than the rule, while a grade male will not do this with any certainty.

The important truths relative to the force of heredity, which every breeder of domestic animals cannot fail to have noticed in his experience, should impress the farmer and stock breeder with the importance of selecting the very best specimens of the kind from his flocks for their perpetuation; and not only this, but a pure-bred ram should always be used; those who, with a view to economy, sire their flocks with inferior animals, will be disappointed in the result; the best will prove the most profitable in the end, in not only supplying better mutton and wool, which will command the highest prices, but in bringing up the standard of the flock and supplying the farm with well-formed and more valuable animals, which will in their turn be better capacitated to perpetuate a superior type of their kind, with the consequent profits to the breeder. Improvement should be the aim with every breeder, and this cannot be effectually accomplished without the proper material to work upon. (SEE BREEDS AND PRINCIPLES OF BREEDING.)

Choice of Buck, etc.—As we have previously stated, grades for sires will prove most unsatisfactory, and as the expense of a pure-bred ram is now so low as to come within the means of almost any farmer, there can really be no reasonable excuse for using grades,

which are objectionable for use even in the common, native flocks, and they should by no means ever be used on thoroughbred ewes, as it would be the surest means of deteriorating the flock. It is true that our ablest scientists and best and most practical agriculturists maintain that "a cross in the blood gives vigor to the stock," but it must be borne in mind that these crosses are recommended to be made with the greatest care, and with a pure-bred male, which, having been made, the continued use of a pure-bred animal upon this cross-bred product is always advised, until the flock has been graded up so that it very nearly approaches one or the other of the original types, neither of which may be exactly suited to the wants of the breeder; if so, a fresh cross can again be resorted to until the desired qualities are obtained.

It is perhaps unnecessary to remark that the buck of any breed should not be used for stock purposes until at least eighteen or twenty months old, and if he has reached the age of two and a half years, so much the better; the most vigorous period being considered from three to six years of age.

He should be strong, healthy, and robust, with fine form and possessing all the desirable points typical of his breed, and should also be as nearly perfect of his kind as possible. Any carelessness or oversight with regard to the selection may make a vast difference with respect to results, as the main dependence of the average farmer for the improvement of his flocks is the ram, and the securing of an animal destined for so important a service as controlling this improvement of the entire flock, considerable liberality in expenditure, and care in selection, will prove the truest and best economy.

Having secured a choice animal, he should be used judiciously and his services turned to the best account, which cannot be successfully accomplished without proper management on the part of the breeder. The best results can be secured by separating from the flock such ewes as are ready for service, placing a limited number in a pen with the ram and removing them as soon as served. When this cannot be conveniently done, he should be turned with a limited number of ewes for a few hours each day, being confined by himself, out of sight and sound of them, the remainder of the time. In such a case a little dry paint or powdered red chalk mixed with oil rubbed upon the ram's breast will aid the farmer in drafting out such ewes as have been served. Liberal feeding two or three weeks before and during the coupling season will be found of great value to successful breeding.

By such judicious management a vigorous buck can serve twice or thrice the number and his powers be no more taxed than he otherwise would when running with a flock of from thirty-five to forty ewes. He should be kept in a stable at night during this season and well fed with grain. He should always be kept gentle by kind treatment and never allowed to be teased or annoyed in any manner, as valuable animals may become cross and vicious, and a source of annoyance on a farm; when they become so they will be found most profitable to be made mutton of as soon as possible.

Selection of Ewes.—The best of the ewes should always be selected, while the old or inferior ones should be yearly thinned out from the flocks for mutton. By selecting the best ewe lambs every year to be kept for breeding purposes, and using, when the proper time comes, a pure-blooded buck, a flock can, by such careful selection, soon be graded up, even from the coarse "scrub" sheep, to an astonishing improved variety. Although it is not as essential that the ewes should be pure-blooded as that the bucks should be, still the better and more improved the ewes, the better the progeny. No ewe should bring forth her first lamb younger than two years, and many breeders prefer, for some breeds, that the ewes be three years of age, as the lambs will then be larger, more vigorous and strong, and the development and constitutional vigor of the ewes not be as liable to be impaired.

As a general rule, ewes should not breed after they are eight years old, although many have fine lambs at even twelve or fourteen years, yet these are the exceptions. and the most profitable results are attained from ewes that are considerable younger.

Care of Ewes during the period of Gestation.—Liberal food for the ewes while carrying their lambs will greatly increase the vigor and size of their young, as well as improve them generally; besides, where an ewe is kept in good condition during the period of gestation, she will have a more liberal supply of milk for her lambs when dropped. Want of proper food will deteriorate any flock, since without a sufficient supply of nourishment no animal can reach a full development, and will soon be reduced to inferior size and quality. The farmer who thinks to economize by stinting his animals or feeding coarse, unpalatable food, at this season, or any other, makes a serious mistake, for whatever tends to degenerate his stock is money out of his purse, instead of in it; and no animal can successfully meet the demands that nature makes in reproducing its kind without the aid of proper food, and that too in sufficient quantity.

By not permitting the rams to run with the flock, the farmer can regulate the time of the appearance of his lambs as he chooses, whether he prefers them early or later. All domestic animals should be petted to a certain extent, and thus be kept tame. This can easily be done by always treating them kindly and accustoming them to be handled so that they will know no fear. Sheep that are wild and timid cannot be as profitable as those that are tame, other conditions being equal, as the labor of caring for a wild flock is much greater; besides, loss of lambs is often occasioned by the running and jumping of the ewes when frightened about the time of lambing. Sheep that are well fed and receive kind and gentle treatment will be tame and quiet.

As the time for the young lambs approaches, those ewes that are the most forward should be separated from the rest of the flock, and put in a clean, warm, dry place. A stable is generally preferred in cool climates; from four to eight being put in together. In this way they can be better cared for, and there will be less liability to trouble, than where a larger number are crowded together. They should have careful attention, and be seen by the keeper often, in order to give assistance, if necessary. But nature does her work best unassisted, and mechanical aid should not be rendered unless necessary, as any undue haste may involve greater danger than the delay. In many instances several hours may be required, the labor recurring at intervals.

The natural presentation of the lamb is with the nose between the fore feet; should the reverse happen, and the hind feet be first presented, as is sometimes the case, there will generally not be much difficulty; when the head is turned back or any other unnatural presentation, the lamb should be gently pushed back and a better position secured by turning. In all such cases of mechanical aid, the hand of the operator should be well oiled with fresh lard or olive oil, and the work done very gently, as rough, harsh, or careless treatment at such a time is not only cruel and inhuman, but would result in the loss of both ewe and lamb. Ewes that are well fed will be less liable to have trouble at such times, since they will be more strong and vigorous than those that receive but indifferent care.

When ewes have had severe and protracted labor, from wrong presentation, injury, malformation or death of foetus, where force has been necessary for relief, causing inflammation, carbolic acid will be found very serviceable in allaying inflammation thus caused, and will often save the animal. It should be procured in solution,—and can be procured of any druggist. One part of carbolic acid in solution, to six parts of soft water, with the help of a large syringe, will remove the difficulty. The application should be to the injured parts, and before any inflammation takes place, if possible. If the difficulty be great, its application should be made two or three times a day. The ewe should be kept very quiet, with no noise or disturbance of any kind.

Ewes that are suckling lambs require a large quantity of food. For a few days after lambing they should be fed on roots and bran, which cools the system and promotes an increased secretion of milk; but after a week or more has passed, richer food may be given, and they

will then increase in flesh. Much depends on the condition of the dams; if the mother is fat, the lamb will be sure to be a fine one, other conditions being favorable.

Wild Sheep of the Mountains.—The following description by a recent writer, of the manner in which wild sheep are bred in the Sierra mountain ranges, is so replete with interest that we give it insertion:

"In the months of May and June, they bring forth their young, in the most solitary and inaccessible crags, far above the nestling rocks of the eagle. I have frequently come upon the beds of the ewes and lambs at an elevation of from twelve to thirteen thousand feet above sea level. These beds are simply oval-shaped hollows, pawed out among loose, disintegrating rock-chips and sand, upon some sunny spot commanding a good outlook, and partially sheltered from the winds that sweep those lofty peaks almost without intermission. Such is the cradle of the little mountaineer, aloft in the very sky; rocked in storms, curtained in clouds, sleeping in thin, icy air; but wrapped in his hairy coat, and nourished by a strong, warm mother, defended from the talons of the eagle and the teeth of the sly coyote, the bonnie lamb grows apace. He soon learns to nibble the tufted rock-grasses and leaves of the white spiraea; his horns begins to shoot, and before summer is done he is strong and agile, and goes forth with the flock, watched by the same divine love that tends the more helpless human lamb in its warm cradle by the fireside."

Period of Gestation in Ewes.—The period of gestation in ewes is about five months, varying from 145 to 161 days, being an average of about 153 days.

The result of observations taken by M. Tessier, extending to 912 ewes, was, that 140 lambed between the 146th and 150th days—mean time 148 days; 676 lambed between the 150th and the 154th days—mean time 152 days; 96 lambed between the 154th and the 161st days—mean time 157 days—giving an average mean of 152½ days.

Management of Lambs.—In a cold climate, the lambs that make their appearance early, especially if the flock be large, require considerable time and care in their management to prevent them from being chilled, but where the temperature is warmer little difficulty of this kind is experienced. However, even under the most unfavorable climate the lamb usually gets on well after the first three or four days; especially if the ewe owns it. The ewe will generally lap her lamb dry, and it will soon attempt to take its "refreshments" in a natural order; but if the mother refuse to lick him, according to the true instinct of most of the brute creation, he should be carefully wiped dry, a piece of old flannel being the best for this purpose. It is well to put him soon to the teat, first starting the milk for him. It often requires much patience to induce a lamb to take hold, but persistent effort will in time accomplish it.

If the weather be cold, the lambs should be attended to at once, as they will soon be chilled. The udder of the ewe should not be allowed to become swollen or caked; to prevent this, when there is a tendency in this direction, the ewe should be milked by hand. When there is a deficiency of milk, the lamb may be supplied from a new milch cow, or in part from the surplus of some other ewe, which can be made to suckle him if held at the time. The milk from a farrow cow will often kill a lamb unless it has a little water and molasses in it. Milk given a lamb should never be scalded, but slightly warmed.

Disowning Lambs.—Sometimes the ewe will not own her lamb, and the shepherd has considerable trouble in this respect. In such a case the lamb must be made dry as soon as possible, and the ewe must be held while he takes his first meal. After the dam has suckled the lamb in this way a few times, she will sometimes own him without any further trouble, especially if they are put in a pen by themselves. A dark pen is thought by many to be better than a light one in such a case.

Young lambs require food often, and should have it at least from six to eight times during twenty-four hours; a little at a time and often is best. Another method adopted by some breeders is to milk from her udder over the lamb, and about the tail, rubbing it on well, which often proves successful. Still another method is to give the ewe a little meal or salt, and while she is eating it put a little on the head and back of the lamb, and hold it to her for her to lick off. By licking the lamb in this way, she will often own it.

Sometimes it becomes convenient to substitute a foster-mother for a lamb, in which case the ewe may generally be made to own him by the above methods, or by rubbing the lamb with the skin of the dead lamb, if she has lost one. When a ewe continues to disown her lambs through two successive years, it is better to fat her for mutton than take the time and trouble of using her for breeding.

Rearing a Lamb by Hand.—When a lamb is reared by hand, which involves considerable trouble, it should be fed regularly about six or eight times during the twenty-four hours for a few days; some breeders say six times between sunrise and ten o'clock at night. After a week or so, a less number of times with larger quantities will suffice. The lamb should be fed milk from a cow that has recently had a calf, and may at first be fed with a spoon. It is a good plan to put the little finger in the mouth of the lamb when feeding it, which will teach it to suck the finger; and after a few times feeding in this way, will learn to suck the finger while the hand is put in a basin of milk, and very soon to drink from a basin without the finger. It requires judicious management to know just how much to feed such a lamb.

There will be danger of over-feeding or not feeding enough for the first few days. In order to make large, vigorous sheep, they should be well fed and cared for. Many valuable sheep have been raised by hand, but it involves considerable time and trouble; yet there is nothing prettier for a pet than a lamb, especially for children.

Food for Ewes with Lambs.—Sheep with young lambs depending upon them for nourishment, should have a good supply of food. Good pasturage is very essential, since a ewe cannot be expected to supply her own wants and manufacture food for another without sufficient material to manufacture it from. It is a good plan to give a few roots, also a little grain, to sheep that have not a sufficient supply of milk, or that have twins or triplets to care for.

Resuscitating Chilled Lambs.—When lambs are dropped in a cold place and become chilled and stiff, sometimes apparently dead, they can generally be revived by the following methods, which have been found very effectual to breeders of experience. The lamb should be taken at once into a warm room, and placed in a tub or some other suitable vessel containing warm water enough to cover the entire body, which, except the head, should lie an inch or two under water. The water should be about 90°, or as warm as could be borne by a person's feet—(as warm as could be borne by the hand might be a little too high a temperature, as some persons' hands, from use, can bear water quite hot).

With one hand hold the lamb's head out of the water, and with the other rub it all over briskly, especially on the legs. In about two minutes add more hot water, continue the rubbing and add water for at least ten minutes, or until it moves its legs, puts out its tongue, or shows other unmistakable signs of returning life. Then remove it from the water, rub dry, and you will be surprised to see it stand. When the lamb is taken out, hold it up gently, in a warm place, by the fore-legs and head, allowing the water to drain off; then wipe over gently to dry; wrap in old flannel, or other woolen, and put it in the basket in a warm place. It should be thoroughly dried before exposing it to the chilly air again. As soon as possible, without exposure to cold, put it with the mother and give it the teat.

If it should prove weak and unable to walk from long exposure, wrap in warm cloths

and lay in a warm place, rubbing occasionally and giving a few drops of whisky or brandy in a teaspoonful of new milk. Many persons, as soon as a chilled lamb is found, at once administer stimulants, whereas if they first try to equalize the circulation in the manner described, success will follow in nine cases out of ten.

The lamb restored to activity, the next thing is to make the ewe own it. The ewe distinguishes its own lamb by the smell, and the process of washing is liable to make the sheep disown her offspring, especially if the mother be young. Take a dish of meal or chopped stuff, give some to the ewe, and while she is eating rub a few handfuls into the wool of the lamb. Rub part of a handful of salt on the lamb's head and along the back, remove the meal from before the ewe, quietly place the lamb under her nose, and as soon as she has a taste or smell of the salt or meal upon the lamb, she will commence to lick it. Then you may go about your business, for when she has once licked the lamb no further trouble need be apprehended in regard to her owning it.

In the same way when a ewe drops twins, one may be transferred to one which has lost her lamb. During the owning process it is always best to confine the ewe in a small pen or tie her up for convenience in placing the lamb near her.

This process of resuscitating chilled lambs works well (especially in the hands of the farmer's wife or daughters), because the warm water will quickly and equally warm every part of the skin at the same time, thus equalizing the circulation quickly and effectually. The danger will be in thoughtlessly exposing the lamb to the cold before it is thoroughly dry.

If this does not fully revive him, a tablespoonful of milk from a new milch cow, with a half teaspoonful of brandy, gin, or whisky, given warm, will prove beneficial; but this should not be given until the hot bath has been tried and circulation restored, as it will then prove more effectual. Wrapping the lamb in old flannel and putting in a warm place, combined with rubbing the limbs and body occasionally with the hand or a flannel cloth, will often restore them. An old sheep-herder in the State of New York gives his method as follows:

"I found in my yard this morning a pair of twins nearly dead. I brought them into the house to a good fire; warmed a blanket and laid it on the floor, and opened the oven door so as to get all the heat I could on the lambs. I then took one egg for each lamb, and beat it well in a tin cup, and, having some hot water in a basin, I put the cup with the egg into the basin of hot water and stirred until warm, but was careful not to cook the egg. I then put my finger into the lamb's mouth every two or three minutes, and gave him two or three teaspoonfuls of the warm egg. In less than one hour the lambs were ready to go back to the yard, and, with a little aid, sucked the ewe. I never had it fail, and have tried it for twenty years."

Docking Lambs.—Though seemingly a cruel practice, docking is essential to the welfare and comfort of sheep, as otherwise the long tail becomes so filthy that it proves a great detriment to the flock. This should be preferred during the first few weeks, the younger the better, provided the lambs be strong and healthy. It may, however, be done at any age from three days to four months of age. It should not be done when the weather is very cold, or very hot, the two extremes being objectionable. If very cold, the stumps will not heal well, and if done in very warm weather, the flies will be troublesome.

Cool, dry weather is the best, and it should be done in the morning, before the lambs have heated their blood by exercising much.

The best manner of doing this is to use a broad, thin, sharp chisel. One person should hold the lamb, while another performs the docking. Laying the tail on a plank of wood, and the person holding the lamb draws or crowds the skin as close to the body as possible, while the operator places his chisel between the bone joints, about two inches from the body,

and strikes it off at a single blow. The skin being longer than the two-inch tail that itself slips over the cut portion, which will soon heal. Many farmers use a sharp knife in docking but the above method is much better. When the knife is used, the cutting should be from the under part of the tail upward instead of downward, as is often done.

To aid in healing the wound, and also prevent flies and maggots from troubling, it is the common practice to apply an ointment of lard and tar, in the proportion of four pounds of lard to one pound of tar. A little spirits of turpentine added to the above is thought by many to be good, also turpentine alone applied. Some also prefer fresh butter to lard in the composition of the above ointment. The lambs should not be exposed to the cold until well.

Castrating Lambs.—As with docking, this operation should be performed in cool, dry weather, and in the morning, if possible; also when the lambs are young, as the older they are the more painful and troublesome it will be; yet at the same time it should be urged that it be not done until the animal be sufficiently strong to endure it, for it is a painful operation, and one that will task his strength to endure. We know of no better directions for this process than those given by Allen as follows:

"After selecting enough of the choicest rams for stock getters, the castrating may be performed at any time between two and six weeks old, when the lamb is in good health. A cool day should be chosen, or if warm, it must be done early in the morning. The best method is for one person to hold the lamb firmly between his arms, about breast high as he stands, while another, with a sharp knife, cuts off the lower part of the scrotum. The testicles are then drawn out till the spermatic cord is reached, which is gently pulled out and cut with a sharp knife. It is sometimes done by simply opening the scrotum, when the testicles and spermatic cord are jerked out. This, however, is a severe and cruel way, and not so safe as the other. The wound should then be rinsed with cold water, after which apply lard."

Neither do we believe in the cruel "jerking" process, and would not recommend it on any grounds whatever, the use of the knife being safer and better every way. It is a very delicate operation, and must be performed with care. The ointment recommended for use in docking is also to be recommended here, especially if the weather be warm. If the weather be cold, when this operation is performed, the lambs should be kept protected until they are perfectly well.

Feeding Lambs.—Whether designed for the farm or the butcher, lambs should always be well fed; this is important in order to produce good size, and form, besides vigor of constitution. Those that are to be raised on the farm should run with the dam until about four months old, and, besides the milk of the dam, should be supplied with an abundance of good rowen hay and fresh water; besides this, when about a month old they may commence eating a little bran, oatmeal, or corn-meal; oil meal is excellent; many shepherds also feed wheat and oats with good results, beginning with a half-ounce per day to each lamb. At first, but little of either the above-mentioned articles of food should be given, until they learn to eat it, afterwards the amount can be increased as the lambs increase in size. When three months old, fattening lambs will eat from a pint and a half to a quart of meal in addition to the milk of the dam.

The feeding can be very easily arranged, and with but light labor, by constructing in some part of the sheep-yard a small pen, with an opening large enough to admit the lambs, but not large enough for the ewes. Lambs designed for the market should be fed until they are taken by the butcher. When designed to take the place of the older sheep on the farm, they should be weaned when four months old.

One of the most noticeable effects of good feeding is seen in the quality of the wool. If the feeding has been irregular, the texture of the wool will be varied, and when twisted

into threads will break in places. If scanty, the wool will be harsh and lack moisture. In sheep and lambs well fed, the wool will be soft and oily to the touch, as well as of a uniform texture.

Weaning Lambs.—The time generally allowed for the lamb to run with the mother is about four months; if they do this longer, it is a detriment to the sheep to be obliged to furnish milk in such large quantities, and so long a time; besides the lambs are quite as well off to depend more upon other food. The first step to be taken is to separate the lambs and their dams as far as possible, so that they may not hear each other's bleating, the lambs in a stable and the sheep in their yard. The lambs should be better fed than previously to make up the loss of the milk; for it is a drawback on the growth of a lamb to be allowed to lose flesh at this period.

The ewes should have an opposite course of treatment; they should be fed with dry hay in order to check the milk secretion; or if turned into a pasture immediately, the pasturage for a week or more should be scanty for this reason. If allowed a large amount of juicy, nutritious food, there will be danger of distention of their udders by the amount of milk secreted, to the extent of causing inflammation or garget.

It will be well to have the sheep milked once a day for a week or so after the separation, to avoid all danger of this kind, as many valuable ewes have been spoiled for breeding purposes through neglect and carelessness in this respect. Some breeders of large experience separate the ewes and lambs for the day, and turn them together at night that they may in this manner relieve their distended udders; others turn the lambs in for an hour during the day.

Some such care should be taken, and the farmer who, as is often the practice, neglects to do this, does so to the detriment of his flock, and his consequent loss. Whenever the udder of the sheep becomes inflamed with danger of serious trouble, such as garget or abscess, a good remedy recommended by high authority, is to give a tablespoonful of Epsom salts with a teaspoonful of ginger (in powder), mixing the compound with water. For the two following days give morning and evening twenty grains of saltpetre.

This remedy is said to so increase the action of the kidneys and cause a consequent determination of blood to those organs, as to greatly relieve the udder. Dry hay should also be fed instead of grass, until the difficulty is over. As soon as the sheep are dried of their milk, they should be put in fine pasturage, and well kept. They should have an abundance in all seasons, with the single exception above mentioned. Both sheep and lambs should always have a good supply of fresh water to resort to whenever they wish. When the lambs are first separated from the sheep, many breeders put one or two old tame sheep in with them for company. They are inclined to bleat less after the dams when this is done; after two or three days' companionship with the old sheep in a yard or other enclosure, they are turned with them into nice pasturage, and will soon learn to follow them as their leaders.

A little extra food, such as oats or meal, should be given each lamb every day, which feed should be increased when the pasturage begins to fail in the autumn. Nature requires material for building up all the cells and tissues, and meeting the various demands that are made for the constantly increasing structure of the growing animal, and unless the material is furnished in the shape of food, the animal will be stunted in growth and imperfect in other respects, therefore we feel the constant necessity of urging upon farmers to *feed liberally*, with good, nutritious food.

General Management of Sheep.—In order to be profitable, sheep should have good care during all seasons of the year. They should be provided with good pasturage with plenty of shade and fresh water in summer, and in winter with warm, comfortable quarters, with a sufficient quantity of nutritious food suited to their wants. It is very important that they

have better care in the earlier part of winter than they are accustomed generally to receive from the average farmer; for without a fair start in going into their winter quarters, they are very apt to decline, as there is an extra demand for food and care during the winter, with a small return for it in wool in the spring, as no sheep that is not in a thriving condition can produce much wool, since the growth of wool always depends upon the condition and health of the animal. When sheep are healthy and kept fat, the wool grows rapidly, and large fleeces are the result; when kept poor, the fleeces will be correspondingly light. No flock can be expected to manufacture mutton or wool without the material to manufacture it from, and that material can be nothing else than the food taken into an animal's stomach.

Sheep should be brought into winter quarters very soon after the severe frosts have reduced or impaired the feed of the pastures, and they should have a little grain every day from the time the grass begins to fail until it is well started in the spring. A sheep breeder of large and successful experience says: "I would rather my sheep would have a gill of corn or oats per day from the middle of November till April, than a pint per day from January till June," thus showing the importance of starting them well in the early winter. A good supply of roots, such as turnips, is also very beneficial at this time. Sheep should not be crowded into too close quarters; the percentage of health is much greater in small flocks, than in large, there being much more danger of disease in large flocks than in small. Some recommend seventy-five or a hundred as a number suited to a single flock, while others are quite successful with from two hundred to three hundred; others still recommend from twelve to twenty as a more profitable number for a flock.

Much, of course, depends on the size of yards, etc., and the general accommodations for large or small flocks, as good ventilation and sufficient room are very essential to the health of any animal; but where the conveniences are such that small flocks can be maintained separately, such a practice would be more desirable. Of course, this would not be practicable in sheep husbandry on the extensive ranches of this country, such as some of those in the Western States and Territories, where thousands of sheep are kept which require the constant attention of shepherds. Its application would be to the general breeder or farmer. The flock should be so divided that the stronger cannot injure the weaker, and in such a manner that all may have an equal chance. The lambs should be put by themselves with a few old sheep; this will have a tendency to keep them tame. The breeding ewes should also be kept by themselves, as well as the large and small wethers. A hospital pen should always be reserved for the sick or injured. Dividing as nearly as possible according to strength and condition, all will have a fairer chance for getting on well, than where large numbers of all ages and conditions are allowed to run together.

Sheds for Sheep, etc. — The yards should be dry and provided with sheds that can afford the sheep comfortable protection from all storms, and to which they can retire when they choose; it would be well to have the yard slope a little in order to better protect it from the accumulation of water. A shed well boarded on three sides and provided with a tight roof, is a sufficient protection for all except in storms or the most severe weather in winter. And if it open to the south, with a southern slope, into a well enclosed yard, so much the better. The addition of sliding-doors, to be closed in case of severe storms, will make a very comfortable winter establishment for any flock.

Arrangements should always be made for proper ventilation, and by that we mean that the animals should have an abundant supply of fresh air, without being exposed to a draft or current of air, which can readily be accomplished with a little ingenuity and forethought in the construction of such a shed. No animal suffers more by close confinement than a sheep, consequently they should be confined as little as possible, and should be allowed the freedom of the yard at all times except during the severest storms. Conditions of climate vary, but

we believe it more profitable for any stock raiser to provide shelter for the flocks, even in the hottest temperature in which sheep are found. Sheep well protected from storms require less food, thrive better, and are less liable to disease than those that do not receive such care.

Originally the coats of our domesticated sheep are believed to have been hair, with a sort of down underneath. The hair has no doubt been supplanted as the result of selection, care, and nourishment. How long since this was done it is impossible to tell, for the domestication of sheep dates back to a very early time. In some parts of the world there can be found hairy sheep now, and Mr. J. L. Hays expresses the opinion that the wool of any sheep will turn into hair if the animal is treated with neglect, exposed, or kept upon hard pasture. He says he has experimented, and that his experiments have resulted so as to convince him of that fact. It is said that hairy lambs are frequently born in the purest Merino flocks in the North of Germany, where the flocks are not always as refined as they might be.

General C. P. Mattocks, Portland, Maine, gives his method of sheep husbandry as follows: "I keep sixty breeding ewes, but in winter have only twelve or fourteen sheep in a flock. These little flocks through the winter each have a yard of one acre, and a small rough shed, ten feet square, open to the south, which remains entirely open at all times except during storms, when the sheep are driven inside and movable doors put up to keep out rain and snow. These sheds are hauled to the pastures in summer for shelter. The sheep are fed in racks, nailed to the fence of the inclosure, and covered with a board with a strap hinge to prevent the hay from blowing away. The grain, as well as the hay, is fed out of doors, except in storms, when the grain is fed inside, as also the hay, occasionally. This plan I do not recommend where the climate will allow the sheep to roam at will over the fields, but in Maine, while the ground is covered with snow so many months, one acre is as good as a dozen. By thus having six or seven flocks of but a dozen sheep each, I am able to sort my sheep in such a way that the stronger can not make continual war upon the weaker. Lambs should always be kept by themselves, as also the bucks.

In lambing time, of course warm quarters must be provided, but as an accurate record of the serving of each sheep is kept, the ewes nearest to lambing are constantly culled out and placed in the lambing yards, which connect with warm sheds and barns. A hospital should always be at hand for the reception of old or wounded sheep, as they require warm quarters and special feed and care, and as their feeble condition is injurious alike to the health and appearance of the flock as a whole. Sheep should not run with, or be fed with other stock in winter. If it is desirable to feed to them the waste of cattle and horses, let it be gathered together and fed to them, but never run the risk of their being injured by cattle and horses. I will here say that in summer I have no difficulty in keeping sixty sheep in one flock, indeed I have kept that number, and more, of Cotswolds together the entire year, with good results.

As most farmers have little but dry hay to feed in winter, they are apt to wonder what they can do to improve upon it. There is not one of them but could raise oats enough for a daily ration of a pint per head, and if the hay could give place once a day to cornstalks, oat straw, or pea straw, it would be much better than the present practice; and here let me say, that no corn fodder is equal to that of sweet corn, when properly cured. A full supply of salt must always be at hand, or else a weekly ration should be fed. Tar, for the sheep to lick at will, is excellent. Should the sheep begin to have a discharge at the nose, as is sometimes the case in bad weather, a solution consisting of one ounce carbolic acid salts, to a gallon of water, used once a week by turning a teaspoonful down each nostril, will soon remedy the evil, care being taken not to allow the sheep to swallow the mixture. Smearing the nose with tar is good in summer to prevent the deposit of eggs in the nostril, which may afterwards develop into the much dreaded "grub-in-the-head," and is also a good practice in

winter, by reason of its medicinal qualities as an antidote for colds and catarrhal troubles, and besides, the sheep soon acquire a taste for it, and derive from it much the same benefit they would from nibbling boughs, containing similar properties, in the forests. If grain is to be fed during winter, as it undoubtedly should be in the New England States, corn should be very sparingly used, while oats and peas can be safely and profitably fed in considerable quantities. Shorts may be fed to advantage. Cotton seed meal has been used to advantage by many of our best flock-masters. The breeding ewes should be taken from the flock two or three weeks before lambing, and fed upon roots, mixed with oatmeal or shorts.

The circumstances and purposes of each breeder must determine whether the lambs shall come early or late. If a farmer has no suitable convenience for early lambing, it is far better to let the lambs be dropped after the sheep are turned out to pasture in May. With warm lambing pens and good care, the lambs may come, even in New England, as early as February; and thus the lambs are ready for the grass when it starts in the spring. It is better when the spring comes, that the sheep should be turned into the pasture a few hours only, each day, lest a too sudden change induce the scours, which is such a scourge to sheep. The sheep should be thoroughly "tagged," by which term is meant the cutting away of the wool under the tail down to, and around, the udder, so that the lambs may not be impeded in sucking, and to prevent the accumulation of filth, which would otherwise seriously impede the movements of the animal.

In the summer the sheep should be changed from one pasture to another, as often as possible. If the farmer has but one pasture, let him run a fence through the middle, and thus become the owner of two pastures, so that his flock may have the necessary change.

With a few simple precautions in the matter of food, and such details as would naturally suggest themselves to a man of ordinary prudence, there is no reason why our thoroughbred flocks should not be as healthy as any others. It is true that ambitious exhibitors have often sacrificed their best animals to a forcing system which may be productive of good results in the show-pen, but can never fail to do great injury to scientific breeding. The fact that so many high-bred rams suddenly drop dead from no apparent cause, could in most instances be explained by an examination of the liver, which would be found to be diseased, simply from over-feeding and want of exercise."

Racks for Feeding, Fences, etc.—Where hay is fed to sheep upon the ground, much of that which is valuable is lost by being trodden into the earth; therefore it is essential to economy as well as the welfare of the flock, that suitable racks or mangers be provided for feeding purposes. The transition from winter or dry feed, to pasturage, is a critical period and liable to be attended with evil consequences, unless it be made so gradual as to avoid any shock to the animal system. If the grain supply be gradually diminished in quantity so as to be kept up until the grass becomes long enough to furnish sufficient sustenance, the evil consequences of the change will be obviated.

In tagging, as well as shearing sheep, great care should be taken not to cut the skin, as any wound would be liable to draw flies which will at once deposit their eggs in it. Should such an accident occur, it should at once be covered with a mixture of tar, lard, and turpentine, as recommended for use in docking or castrating lambs. Sheep husbandry is attended with much less expense in the South and Southwest, than at the North, where much of the food for the flocks must of necessity be stored for winter use when the ground is covered with snow.

Good fences are requisite where sheep are to be confined to a pasture, and as they are notorious jumpers, a pasture may as well have no fence at all as a poor one, since the entire flock will be liable to follow one bad example of this kind. Good fences will save the farmer much annoyance and expense, besides the satisfaction of always knowing where to find his flock. They should be constantly watched, for straying sheep will be liable to soon become

lost, and when the habit of changing their quarters in this manner is once established, it is the source of great trouble and annoyance to the owner. The sanitary condition of the flock should receive constant attention, and should any become diseased they should at once be separated from the others, and kept by themselves until entirely well. Contagion can in this way be avoided. A lack of oversight in this respect is sometimes the loss or damage of nearly an entire flock. Sheep should never be kept in marshy, wet lands; no stock can be kept healthy in such localities. They will subsist on poor pasturage, but it must be on dry soil to be favorable to the health of the animals.

Sheep Folds.—In some sections it is customary to put sheep in a fold every night as a precaution against the depredations of dogs, or other animals; in newly settled localities they are very essential as a means of protection against wolves and other wild animals. A fold can be made to last a number of years at slight expense and labor. Commissioner J. B. Killebrew, of Tennessee, has described, in his treatise on "Sheep Husbandry," the manner of constructing a sheep-fold, as follows:

"Select a suitable spot near the dwelling as may be. Let it slope so that it will not become muddy or sloppy. Let it be in size to suit the number of sheep intended to protect. An acre of ground will suffice amply for from one to five hundred sheep. Let it be enclosed by any means that will exclude a dog. One used for years by the writer was made of pickets, cut eight feet long and put two feet in the ground, well packing and stripping it on the inside. It is not necessary to sharpen the ends, as, if closely put together, it will never be passed by dogs. Have an entrance by a door, so that when shut the fold is closed. If pickets are not convenient, a plank fence will answer equally well, only it will require more constant care to keep it in repair. About 1,700 pickets are required to make a fold, worth, when of cedar, $3 per hundred. It will cost seven cents a yard to dig the trench and put them up. The strips, four inches wide and one inch thick, will cost $1.50 per hundred feet, and the nails will cost about two dollars more. So a good substantial fold made of cedar, which will last, with slight repairs, at least twenty-five years, will cost say $75, which is a very small sum to pay for security and peaceful nights.

If one wishes to economize, he can either enclose his barn with such a fence, or some other of his outbuildings that require an enclosure, and thus save a double expense. Thus, while his neighbors are continually annoyed by dogs, and sustaining heavy losses with destroyed or harrassed sheep, he can turn the key on his flock and quietly go to bed, satisfied his flock will be safely in the fold next morning.

The fold should be also sheltered on the inner side, to allow the sheep to feed during the long nights and be protected from the rain, as well as have good dry hay to go to. The shelter should be not more than four feet high, and the length of two boards will be sufficient. Next the fence racks can be constructed in the following manner: A round pole from the woods or a heavy scantling is laid against the bottom of the pickets, and secured there by stubs driven in the ground. Then bore one and a half inch holes in an oblique direction, so that slats or rounds driven in the holes will have a slant of about forty-five degrees from the fence. Then fit on the other ends of the rounds a companion scantling, about four feet from the ground pole. This scantling will then serve as a support for the roof, letting one board extend from the scantling to the fence, and another outwards, with the outer ends resting on a plate two inches square, which is itself supported by stakes, at intervals of six or seven feet, firmly driven into the ground.

At intervals of eight or ten feet place some two or three boards nailed together, but movable, so they can be raised to put the hay in the rack. Then nail two planks, seven or eight inches wide, together by the edges so as to form a V-shaped trough, supporting or bracing it by nailing strips across at intervals of twelve inches, which will serve not only as a brace, but also prevent the sheep from throwing their food out. Nail this trough firmly to

the ground pole of the rack, and there is a barn far better than the most expensive covering ever built by the amateur farmer. It protects them from rain and snow, and keeps their food dry, and prevents it from becoming worthless from tramping and defiling. Should the flock become so large that all cannot eat at the same time, supplementary racks and shelters could be erected by building a fence or plank wall four feet high, and sheltering and racking both sides as their necessities may require.

Nor does the advantage of the fold stop with the security of the sheep. It is said the foot of a sheep is golden. During the day he distributes his rich manure over the pastures in an admirable manner, carrying it where most needed on the Slpoes and thin soils of the higher lands. By proper attention to raking, saving, and sheltering, here can be gathered and garnered a rich store of plant food. And it is truly astonishing what a large amount of valuable manure can be collected in a short time. The litter, such as straw or leaves, that has been or should be spread under all the sheds, will become saturated with the urine, and this, thrown on the general heap, generates an immense amount of ammonia, which, lodging in the mass of decaying vegetable matter, makes a manure unexcelled by any."

Food for Sheep.—In England sheep are not given the run of the entire pasture as in America, but are confined to certain limits by means of movable fences or hurdles, and thus are given a portion of fresh ground each day, in addition to that of the preceding day or two. This, of course, necessitates considerable trouble in constantly moving the fence, but English farmers seem to consider this a profitable practice or they would not continue it. Then, there is no waste; and a fresh supply of herbage is given the flock each day. In spring the crop is winter rye, or rye and vetches. Later follows the clover and early turnips, hay being always fed twice per day when turnips are given. Swedish turnips are the roots that are usually most fed there during the winter. Although the English practice of hurdling flocks might not be considered profitable to the American farmer generally, where there is no lack of land, and the farms in most portions are generally large, still we think it would be far better for our flocks if a fresh field could be given them more frequently, even though it might not be large, and the objection of constantly feeding over the same ground avoided. This could be accomplished at slight labor and expense by dividing the pastures into two or three sections and feeding them alternately; this practice would be better both for the lambs and sheep, preventing too close cropping of the herbage, and providing better food for the flock.

Frequent change is necessary in order to keep the sheep contented, and unless it be given them, they will become restless and jump out and seek fresh pasturage; therefore it is better to give them a change as soon as they become uneasy. In order to do this, it is well to divide the field by fencing, or if on an extensive range or ranch they should be driven to another section.

Good hay, composed of clover and the cultivated grasses, are among the best of sheep food. Beans are especially adapted to sheep, of which they are very fond, being nutritious, as well as valuable in the promotion of wool growth. Bean and pea straw, in fact all kinds of straw, can be utilized by them also with profit, but it should always be cut and mixed with bran, meal, or other kinds of food. Roots are especially adapted to them, and should be given, for a time, at least, when making the sudden change from fresh grass to dry hay in coming into their winter quarters, the juices of the roots making up in a measure the loss of moisture in the green herbage. Some flock-masters consider this change the most critical period during the entire year, as the sudden change of food is liable to induce disease, and anything that will have a tendency to modify this sudden change of diet should be given if practicable. Turnips should also be fed to ewes a few weeks before and after dropping their lambs, to increase the milk production. Much grain is regarded by many injurious, especially large quantities of corn, as it is considered too heating when given in large quanti-

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ties without other food; it is also one of the best fattening articles of food that we have. When mixed with oats and bran the injurious heating effect is largely obviated. Corn meal can be fed without injury in larger quantities than corn, and is very good for young lambs, or old and feeble sheep. Oats and wheat have been found by experiment to be excellent in keeping a flock in a good and thrifty condition. Breeding ewes are greatly benefited by being fed considerable bran, as it contains the essential elements of bone and tissue formation; but breeding ewes that are thin in flesh will put on fat by giving them for a time all the corn they can bear; however, there is danger of overfeeding, and this may be avoided by mixing bran or oats with corn, and by having at least a part of the corn ground.

Oats, as well as turnips, induce an increased flow of milk, and assist in keeping up the condition of the dam. Oil-meal is very nutritious and aids in putting on flesh; it is valuable to feed with bran or oats. The age and condition of sheep must be taken into account before determining the quantity or quality of food to be fed, whether the object be for fattening for the market, or for improving the general condition of the animal. Young sheep require a different composition in food to change them from a lean condition to a thrifty one. The same amount of food will put more flesh upon yearlings than those sheep that are three or four years old. The young animal requires food richer in albuminoids and phosphate of lime, or such elements that go towards the formation of bone and muscle.

One-half pound of linseed meal or cotton-seed meal, mixed with one and a half pounds of corn, is thought by many to be a valuable combination when given in the quantity of two pounds per head per day in connection with any kind of hay, which makes a full ration for most sheep in fattening. Whatever the food given to sheep, regularity should be observed in respect to time, giving as nearly as possible at stated regular hours each day. If fed in this manner, they will soon learn to know when the time for feeding comes, and will eat and be quiet until the time for feeding again; but if fed at irregular times, they will be uneasy and restless, and consequently will not thrive as well. Regularity in quantity as well as in time of feeding is also essential, since it will largely influence the evenness of the wool fibre. If full feeding is followed by a scanty allowance, or the reverse, the fibre of the wool is correspondingly affected, the generous diet enlarging the wool fibre, and the limiting of the quantity of food contracting it, producing an unevenness in the wool that is very injurious to its quality, and consequently deteriorates its value.

The following results of the experiments in feeding sheep, furnished by Dr. Lawes, of Rothamsted, England, and which were performed by himself at his noted Experimental Station, will doubtless be both interesting and profitable to the farmers and stock-breeders of America.

In the following table are shown the average weekly consumption of food, and increase of each animal, throughout an entire period of nineteen weeks:—

TABLE

Showing the Average Weekly Consumption of Food per Sheep, and the Average Weekly Increase of each Animal in pounds and ounces.

Pen Nos.	Average Pounds Weight of Sheep at commencement.	Description and Quantity of Food per Sheep per Week.	Sheep Numbers.					Average Weekly Increase per Sheep in each pen during the entire period of the experiment.	Average Weekly Increase per Sheep in each pen during the first 11 weeks of the experiment.
			1	2	3	4	5		
		lbs. oz.							
1	121½	Oil Cake . 7 0 Clover Chaff 22 2	1 6¾	1 11¾	1 11	1 9½	1 9½	1 9½	1 15½
2	121½	Linseed . 7 0 Clover Chaff 20 0	0 13½	1 3¼	2 5	1 7½	1 11	1 8	1 11¼
3	120½	Barley . 7 0 Clover Chaff 20 14	1 7½	0 14¼	1 8½	1 14½	1 8½	1 7¼	1 14
4	120½	Malt . 6 9 Clover Chaff 20 12	1 3¼	1 2½	1 1½	1 4¼	1 10	1 4½	1 13

It will be seen by the above table, that the number of sheep experimented upon in this case was twenty, and that they were put in four separate pens of five sheep each; the sheep being as nearly alike in condition, weight, age, etc., as possible, which is the only proper principle upon which a just estimate of any such experiment can be made.

TABLE

Showing the Mean Weekly Increase of Thirty Sheep, fed upon Green Clover, and 1 lb. each of Oilcake, during a period of Eleven Weeks.

Sheep Numbers.	Weight June 5.	Weight in lbs. August 21.	Pounds increase in 11 weeks.	Average weekly Increase.
				lbs., tenths, etc.
1	117	161	44	4.00
2	103	133	30	2.73
3	112	147	35	3.18
4	108	148	40	3.64
5	101	134	33	3.00
6	106	143	37	3.36
7	100	131	31	2.82
8	123	161	38	3.45
9	115	155	40	3.64
10	98½	142	43½	4.00
11	113	145	32	2.91
12	126	157	31	2.82
13	111	145	34	3.09
14	117	158	41	3.73
15	113	145	32	2.91
16	129	162	33	3.00
17	116	154	38	3.45
18	109	149	40	3.64
19	114	145	31	2.82
20	111	142	31	2.82
21	103	138	35	3.18
22	110	146	36	3.27
23	107	145	38	3.45
24	116	146	30	2.73
25	101	144	43	3.91
26	97	131	34	3.09
27	115	158	43	3.91
28	101	140	39	3.54
29	109	143	34	3.09
30	116	152	36	3.27
	3,317½	4,300	1,072	3.28mean

With regard to the above, Mr. Lawes says:

"The rate of increase here indicated falls little short of the wider estimates usually formed on this subject; and, while we are satisfied of the correctness of the figures given above, and do not doubt the statements of others, yet we are convinced that such results are very mischievously misapplied, if it be concluded that they in any degree fairly represent the average increase obtained in practical farming. Indeed the circumstances under which these sheep were placed were in every respect the most favorable that could be imagined, viz., summer weather and the feed of a luxuriant crop of highly manured clover, with oilcake besides—conditions which at best can be equaled during a few months only of every twelve."

TABLE

Showing the Consumption of Food and the Increase of Animal, per Week, for each 100 lbs. Live Weight.

SHEEP.

Description of Animal.	Number of Animals.	Duration of Experiment.	Average Food consumed per Week to each 100 lbs. live weight of Animal. — Description.	Quantities.	Increase per Week upon each 100 lbs. live weight.
		Weeks, Days.		lbs. oz.	lbs. oz.
Hampshire Downs	40	26 0	Oilcake	5 4¼	1 12¾
			Clover-hay	4 11½	
			Swedes	71 10	
Sussex Downs	40	26 0	Oilcake	5 4¼	1 12¼
			Clover-hay	5 0¾	
			Swedes	68 0	
Cotswolds	40	20 0	Oilcake	5 5¼	2 1½
			Clover-hay	4 8¾	
			Swedes	74 11	
Leicesters	40	20 0	Oilcake	4 12	1 12¾
			Clover-hay	4 8½	
			Swedes	67 13	
Cross-bred Wethers	40	20 0	Oilcake	5 0	1 14¼
			Clover-hay	4 12¼	
			Swedes	70 10	
Cross-bred Ewes	40	20 0	Oilcake	4 15½	1 14
			Clover-hay	4 11½	
			Swedes	69 5	
Hants Downs (Fed till Christmas, *i. e.* 31 weeks, 5 days, longer than 40 Hants above.)	8	6 0	Oilcake	5 9¼	0 14¾
			Hay-chaff	2 12½	
			Mangolds	64 8	
		12 0	Oilcake	5 2½	
			Green Clover	*ad lib.*	
		13 5	Oilcake	5 6¾	
			Hay and Clover chaff	1 13¾	
		31 5	Norfolk Whites or Swedes	*ad lib.*	
Sussex Downs (Fed till Christmas, *i. e.* 31 weeks, 5 days, longer than 40 Sussex above).	8	6 0	Oilcake	5 10½	0 15½
			Hay-chaff	3 12½	
			Mangolds	70 0	
		12 0	Oilcake	5 4¼	
			Green Clover	*ad lib.*	
		13 5	Oilcake	5 8	
			Hay and Clover-chaff	2 1¼	
		31 5	Norfolk Whites or Swedes	*ad lib.*	

It will be seen by the above, that among the breeds experimented upon, the Cotswolds gave the largest per cent. of increase per week on each 100 lbs. live weight, and also the largest per cent. of increase per week in proportion to the amount of food consumed. Dr. Lawes by a course of experiments also established the fact that to produce 100 lbs. of mutton, it will be necessary to feed 272½ pounds of oilcake, 252½ pounds of clover hay, and 3,753 pounds of rutabagas. The various conditions of the animals are taken into consideration in arriving at the conclusions, as well as the varying value of feed and its quality, together with

all the circumstances of disturbance and repose in which a flock may be kept, and he estimates that to produce one pound of flesh, it will be necessary to feed under shelter according to the following table; or if in open pasture, it will require the addition of one-half the quantity, it being based upon the calculation of there being no other food within reach of the animals.

TABLE.

Rutabagas fed under cover, ...	100	pounds will produce 1 pound of flesh.
Good clover hay, ...	12	" " " " " " "
Beans or Peas, ...	8	" " " " " " "
Oats, ...	7	" " " " " " "
Barley, ...	6	" " " " " " "
Linseed oilcake meal, ...	6	" " " " " " "
Linseed oilcake meal and peas mixed, ...	4½	" " " " " " "

The value of mixed food will be seen in the last item, where oilcake meal and peas mixed will produce one pound of flesh for every four and a half pounds, while peas alone require eight pounds for that result, and oilcake six pounds.

When fattening sheep for mutton, the kind and quantity of food will depend much upon the age and general condition of the animal, viz.: whether the sheep is growing, or has reached maturity; whether there has been a drainage of the system by breeding or furnishing milk for lambs, etc. By separating the flock to be fattened, and grading them according to these conditions, putting those of a grade together in a pen, better results will be reached than by feeding all together. The noted Dr. Voelcker, of the Royal Agricultural Society of England, found that by feeding four sheep on stated rations for seven weeks, the following results were obtained: The animals consumed during this time 196 pounds of clover hay, 49 pounds of linseed-oilcake, 3,743 pounds of mangel wurtzels, which furnished a daily ration to each animal of 1 pound of clover hay, 4 ounces of oilcake, and 19½ pounds of mangels. The nutritive element contained in this daily ration would be, according to scientific estimate, about 4⅛ ounces of flesh or muscle element, 53½ ounces of fat element, and 4¾ ounces of mineral element.

The result obtained was:

	Weight at commencement.	At end of seven weeks.	Gain of each in weight.
No. 1,...............	153 pounds.	170¼ pounds.	17¼ pounds.
No. 2,...............	134 "	151¼ "	17¼ "
No. 3,...............	170 "	187 "	17 "
No. 4,...............	135 "	155 "	20 "

It has been ascertained by repeated experiments that 100 pounds of roots fed in a yard provided with shelters will give one pound of live weight to the sheep, while if the sheep be fed in an open pasture, without protection from the climate, it will require 150 pounds to produce the same result, and this relative proportion will usually prove true with regard to other kinds of food.

It has also been demonstrated that if one and a half pounds of oil cake is given daily with the root feed, the increase will be two pounds for every 100 pounds of roots. When peas, beans, and hay were fed with the roots, it was found that eight pounds of this mixed feed would make an increase in weight of one pound; seven pounds of oats or six pounds of barley, with the same quantity of roots as before, gave also one pound of increase in weight. Mr. E. W. Stewart, one of the best authorities on this subject in the country, gives his opinion as follows on fattening sheep for market, showing the different results of feeding (1) pure corn, (2) oats and corn, (2) bran, oats, and corn, (4) oil meal and corn, (5) roots and corn:

"1. Pure corn, as a food for fattening sheep in connection with hay, has been used more in this country than any other grain. Corn is one of the best fattening foods at our command when judiciously used. It contains 62 to 66 per cent. of starch, and 5 to 7 per

cent. of oil, and these elements are very digestible in corn. The starch is most admirably adapted to the production of animal heat, and the surplus goes to lay on fat; besides, the 5 to 7 per cent. of fat is ready formed to be deposited in the animal body. But corn contains these carbonaceous elements in such large proportion as to make it too heating when fed alone in large quantity. The albuminoid or muscle-forming element of corn ranges from 8 to 10 per cent., giving a nutritive ratio of one of albuminoids to from 7.5 to 10 of carbhydrates—this is too low a nutritive ratio for fattening, unless combined with more nitrogenous food. But if good clover hay form part of the ration, then corn makes a very profitable addition. Clover has a nutritive ratio of from 1.4 to 1.7. And if the ration is composed of 2 pounds of clover hay and 2 pounds of corn, it gives 3.40 pounds of dry food, with a nutritive ratio slightly under 1.6, which answers well for a fattening ration. And as sheep are fattened largely in winter, corn is found to be one of the best foods to keep the sheep warm, and thus assists in the laying on of fat.

2. Oats and corn, mixed in equal weight, constitute a most excellent grain ration for sheep. The oat has a larger proportion of albuminoid and less of starch than corn, and, thus combined, the ration is less heating, and is especially appropriate for summer fattening. One and a half to two and a half pounds of this mixed grain, fed with any fair quality of hay, will be a successful fattening ration for sheep.

3. Bran, oats, and corn, mixed in equal weights, form a ration, better, perhaps, than the last, because the bran has a larger proportion of nitrogen than oats, therefore reduces the nutritive ratio and improves the combination. Bran is also cheaper than oats, and therefore reduces the cost of the ration. Three pounds per head of this combined ration, fed with straw even, will be successful, or if fed with two pounds of good hay may be reduced one-half.

4. Oil meal and corn have been used as a practical ration with great advantage. The new-process linseed meal, which contains more albuminoids and less oil, will be quite as good as the old-style oil meal to combine with corn, because corn is so rich in starch and oil that they balance each other. One-half pound of linseed meal or decorticated cotton-seed meal, with $1\frac{1}{2}$ pounds of corn, makes a good combination, and 2 pounds of the mixture per head, with any kind of hay, will be a full ration for most sheep.

5. If we compare turnips with corn, we find 3 pounds of corn fully equal to 22 pounds of Swedes, and 1 bushel is equal to 411 pounds of Swedes, and 40 bushels (or one acre) of corn equals $8\frac{1}{4}$ tons of Swede turnips; and this, in the West, with corn at 30 cents, would make turnips worth only $1.48 per ton, and at 50 cents per bushel corn would be as cheap as turnips at $2.42 per ton. It is hardly probable that roots will ever be raised in this country as extensively as they are in England, because, when compared with grain as to nutriment, they are no cheaper; but they have a great value in promoting the health of sheep and cattle, and they should be used in moderate quantity for that purpose, making up the ration with other food.

The combination No. 4 will generally produce the most rapid fattening, and the oil meal will have about the same laxative operation upon the digestive organs of the sheep as a moderate feed of turnips. It is no doubt economy to feed a small quantity of oil meal, say one-fifth to one-fourth of a pound, with all the rations mentioned, except perhaps with turnips. The oil meal would not increase the cost of the ration materially, as it would reduce the other elements of the ration. The oil meals are peculiarly adapted to the growth of wool, and promote its quality. Sheep-feeding requires a very observant shepherd, who can take into consideration the individual wants of his flock. There is no department of feeding requiring more skill."

Hurdles for Sheep. — These are often a great convenience in confining sheep to pastures or cultivated fields, such as of turnips, rye, etc., and are sometimes used in this country, though not extensively. Mr. Killebrew thus describes them:

"Take a four-square scantling, any length desired, and bore holes through it at right angles, one on each side alternately, about ten inches apart. Then put through these holes stakes six feet long. The holes should be two inches in diameter, and the stakes should be of good, tough white oak. When completed, it will have the stakes projecting in four directions three feet long. Laid upon the ground, it presents a *chevaux de-frise* that no sheep will jump. A double row of these laid across a clover lot enclosing ten or fifteen feet in width will confine the sheep to that spot, and prevent tramping or picking over the whole field. Not only this, but when they have passed over the field, which is done by simply rolling the double racks, which they resemble, over and over, as the clover is eaten clean, the clover in the rear has renewed itself, and is ready for another going over. This plan applies not only to clover, but to any kind of pasturage, such as sorghum, rye, Egyptian grass, or any of those cultivated grasses that will grow from the stub after being eaten down.

By judicious management of this hurdle a field infested with noxious weeds can be cleaned completely of them, and at the same time brought to a surpassing state of fertility."

Salt for Sheep. — It is asserted by some flock-masters that no one thing contributes more to the health of sheep than salt. However this may be, it is absolutely certain that salt is very essential to the health and general welfare of the flock, and that sheep cannot thrive well without it.

It obviates injury from the great and sudden change from dry to green food in the spring, often so detrimental, and is a preventive against fermentation of the green mass in the stomach, as well as of some of the other difficulties and diseases to which sheep are liable.

The best manner of supplying the flock with salt is to have it in boxes where it will be well protected from the rain, and where the sheep can have access to it whenever they wish. If this plan is not followed, they should have a supply given them at least once a week. Some shepherds prefer a little sulphur mixed with the salt. We believe those flocks thrive best, other conditions being equal, that have a constant supply of salt, and clean, fresh water, where they have access to them whenever they choose.

Water Supply for Sheep. — Although it is often claimed that sheep are an exception to domestic animals generally in respect to the necessity of a supply of water in order to be kept in a thrifty and healthy condition, and that they can get along just as well without it, depending upon the dew that is nightly deposited upon the grass for quenching their thirst, yet we doubt if any sensible shepherd of sufficient practical experience to thoroughly understand his business would concur in such an opinion. That sheep *can live* in pastures without a supply of water is probably true, and cannot be denied; but that they will thrive as well with such treatment, and prove as healthy or profitable, we do not believe can be proved. The regularity with which they visit the accessible drinking places, and the pleasure and satisfaction evinced by them as they there slake their thirst, proves that Nature intended water as much for the sheep as other animals, and leaves no ground for debate as to the desirability of having a plentiful supply of good water within their reach. Sheep require less water than most of the other domestic animals, but they should never be subjected to the entire privation of it. It is often noticeable in a flock of sheep, when being driven quite a distance, that, although they may be very tired from a long journey, they will sometimes, all at once, seem inspired with a new impulse, and, lifting their heads, hurry off in a certain direction, as though all were of one mind respecting reaching a certain point as soon as possible — it may be a mile or more distant — the entire flock often galloping off in "sheep-trot" style in that one direction, which, when the point is reached, will be found to be a spring or other water supply, where they will quench their thirst; thus showing how much keener is the sense with which they will scent water than that of any other animal, and how

much they relish it. All of which are the more than infallible hints that nature gives the shepherd, that in supplying his sheep with an abundance from the "green pastures," he should forget not the "still waters."

Shade in Sheep Pastures.—A sufficient number of trees to give shade in pastures during the sultry season to stock that may be pastured there, are of great value to any field. A few spreading trees are not only attractive, and therefore an ornament to a pasture, but are a necessity to the comfort and welfare of animals that may occupy it.

Anything that contributes to the comfort of our domestic animals contributes in a corresponding degree to their profit, for without comfort and contentment among them, there will not be any great degree of thrift, and no farmer has any reason to expect his sheep to thrive without shelter from the scorching sun in the heated summer season,—conditions that he would find intolerable himself.

Aside from the question of humanity, which ought of itself to be a sufficient reason for restraining the owner of stock from permitting his animals to be subjected to any species of cruelty, the profits arising from rendering them comfortable will amply repay for the trouble and expense involved; therefore where the sheep pastures are not already shaded by trees, we would advise that cheap sheds be made in sufficient numbers to accommodate all with shade, and thus render them comfortable. The labor and expense involved will be but a trifle compared with advantages thus gained. As in considering the question of providing water for sheep, their natural instincts are a sure and safe index of their necessities; and it is a well known fact that they will eagerly seek shade when it is within their reach, and will endeavor to make a shade by crowding together and dropping the head under each other's bodies when no shade is to be found in the pasture.

Some shepherds provide shade by means of cheap open sheds of boards; others by throwing boughs upon a framework of posts and poles; better than either is a little grove of trees of sufficient size to make a good shade for the whole flock. To obviate the danger of developing and spreading infectious diseases by the flock spending so much time closely huddling together, the sheds (which may be made movable) can be occasionally moved to fresh ground; or, if made permanent, the ground underneath can be thoroughly scraped, the manure removed, and the place of rendezvous made fresh by plowing, thus bringing the cool, clean soil to the surface to come in contact with the feet and bodies of the sheep. Every man should "be merciful to his beast," and nothing shows the quality of true manliness more than kindness and mercy extended to aught that can suffer, whether it be to man or beast. Hard and indifferent must be the nature of him who could impose needless suffering upon so meek and patient an animal as the sheep, while, as we have previously stated, in considering the profit, this comfort can be so easily obtained, and will result in so great advantage in a money point of view, that no farmer or shepherd that has an eye to economy should fail to give it the attention that the subject demands.

Washing Sheep.—The practice of washing sheep two or three weeks before shearing, formerly so common, is recently becoming unpopular, and we hope the time will soon come when it will be discarded entirely. We believe it not only an injurious custom, as far as the flock and the washer are concerned, but it is a cruel one as well, to plunge such a timid animal as a sheep into a stream of cold water, thus suddenly reducing the temperature of its body several degrees, and half paralyzing the poor animal with fright; besides, they must of necessity carry a wet fleece for some time, which will often be the cause of disease, such as colds, catarrh, chills, fevers, rheumatism, etc., to say nothing of the discomfort or suffering that may result.

Washing is also a means of often spreading a contagious disease in a flock, such as foot rot, or scab, by washing one or two animals affected by it in the same locality. It is some-

times the cause of garget in nursing ewes, and abortion with those in lamb. Sheep are often driven a long distance to be washed, when no suitable stream is near the farm, and in warm weather, which it must be of necessity, that the water of the brook or river be suitably warm for the purpose, and even then the change of temperature in plunging them into the stream must be very great. Sheep have been known to suddenly die in the water under such circumstances. A farmer of large experience in sheep-breeding tells us that he had one die in this manner recently, which, when taken into the water, seemed paralyzed by the shock, and died with scarcely a struggle. It could not have been drowned, for its head was out of the water, and it would have been impossible for a sheep or any other animal to have drowned under the circumstances.

At another time he had a fine sheep die a few hours after washing, that to all appearance was perfectly well before. Besides the labor of washing, and danger to the sheep, it is much more dangerous to those who perform the work to stand in water for several hours, and many serious diseases, if not deaths, have been occasioned by it. It must indeed be a vigorous constitution to endure the ordeal unharmed. The water of streams in which sheep are washed often becomes muddy by disturbing the sediment or sand at the bottom, which settles in the wool and injures it.

Again, good judges of wool, who are, with rare exceptions, the buyers, can tell very accurately, even to a fraction, what will be the shrinkage, which is generally one-third, in cleaning, and manufacturers always cleanse every fleece of wool before using it; therefore we consider washing the fleece on the sheep entirely useless; besides, as sheep are not sheared for at least two weeks after washing, the wool will accumulate considerable foreign substance in that time,—a fact known to wool buyers, and they base their prices accordingly.

Besides the objections previously given, washing is a very inconvenient practice in the cooler temperatures, and at the North the shearing is often delayed very late, in order that the water of streams may be sufficiently warm for the purpose, while the temperature of the atmosphere might be warm enough for shearing considerably earlier. It also requires time for wool to regain its former softness and elasticity after washing. We have often seen sheep that looked much worse after washing than before, by being driven a long distance over a dusty road after the process. Where farmers prefer to have their wool washed before selling, it can be done much easier and better in the fleece than on the sheep's backs, but we would advise that the entire cleansing process be left to manufacturers.

Sheep should be kept as clean as possible without washing, and care taken to prevent the accumulation of all foreign substances, such as burs, twigs, hay-seed, etc., and all fragments of wool that have become filthy with manure (which is common where sheep are first turned out to grass) should be clipped off. With a little care a flock can be kept quite clean. When hay is stored over a shed in which sheep seek shelter, the floor on which the hay rests should be very tight to prevent the hay seed and dirt from sifting down on to the backs of the sheep, as this accumulation is quite difficult to remove and damages the looks of a flock of wool fleeces when sheared.

To all farmers we would say, whatever has been your former practice, don't wash your sheep, for it is a worse than needless task.

Shearing.—The shearing of sheep is an art only to be acquired by practice, whether it be performed by hand or machine, and not every one who professes to be an expert in the business will be shown to be such by his work. Great injury is often done both the sheep and wool by rough handling or carelessness in cutting, in which case either the skin of the sheep is cut, or the staple of the wool injured by being severed, or by not being cut sufficiently close; a very little carelessness resulting in making a wound in the skin that will require nearly all summer to heal, or in leaving sufficient wool in unsightly ridges about the head, flanks, legs, and other portions of the body to more than equal in the aggregate, the cost of

shearing; therefore if a farmer wishes to know whether his sheep are well sheared, he should not only look at the sheep to see if it be smoothly shorn, but also at the inside of the fleece to see if there are any short pieces of wool, caused by severing the staple, as a sheep may be smoothly shorn and the fleece badly injured in this manner. Wool buyers are very particular about the latter, since an occasional severing of the fibre is a great damage to the quality of the wool.

Sheep should be sheared in a warm, bright day, and *never* in damp or chilly weather. The practice of many farmers of waiting for a rainy day, that cannot be appropriated to any other farm work, is a pernicious one, as the sudden change of removing so warm a covering from the bodies of the animals is a very great change to them, even in warm weather, and often results in their taking cold.

When the work is performed by hand, the operator should be provided with a good sharp pair of shears and the means of sharpening them, as dull tools in this business are a great hindrance, and involve not only loss of time, but work imperfectly performed. Some shearers prefer to work upon a barn floor, laying the sheep down and taking a position beside it, resting on the right knee, while others prefer a bench from twelve to eighteen inches high, on which the sheep is laid, the shearer standing beside it; in both instances the left knee braces the body and supports the sheep in the several positions that are necessary for convenience in shearing.

Some prefer the bench on which the sheep are placed in shearing considerably higher than the above mentioned. The bench should be perfectly smooth to prevent any injury to the fleece or sheep, the barn floor to be kept as free from dust, straw, or other accumulations as possible, cleanliness in wool, and freedom from all foreign substances affecting its quality. The shearer should possess patience and ingenuity, a steady hand, and a determination to do honest work, which, combined with a little practice, will soon result in the acquisition of considerable skill in the art. It is hard labor for both shearer and sheep, especially the latter, and both should have as comfortable a position as possible. Unless the position of the sheep be easy, it will cause much trouble by struggling, besides injuring the appearance of the fleece.

The wool should be cut rather close, taking great care not to cut the skin or teats. When the skin is once cut it often requires a long time to heal. When such an accident occurs, the wound should be completely covered with tar, to prevent the maggot fly from depositing its eggs in it.

There are various methods of shearing. Some place the sheep on the left side and begin by cutting all the tags off, which are put in a basket one side, that they may not be mixed with the wool. Placing the shears near the right flank, pointed towards the fore legs, they shear first the belly of the animal; then placing the sheep on its rump, with feet projecting outward and head bent over the shearer's left knee, shear the neck, head, and legs; afterwards the sides, letting the fleece roll off at the rump. Others prefer to open the fleece at the neck, shearing the belly and legs with the sheep in position on its rump, and afterwards shear the sides and back of the animal.

Others still set the sheep on its rump and shear the neck and fore shoulders; then lay it upon one side, and when the upper side is sheared, turn the animal over and take the wool from the other. In cutting, the hand should be kept well away from the body of the animal, so as to bring the point of the shears near the skin, and never take but one cut at the same length of fibre; if two cuts are taken, the fibre is injured. The main fleece should always be taken off whole, and if the sheep is gently and carefully handled, combined with skill in using the shears, it will come off in this manner.

The wool from the belly and portions from the head and neck with trimmings from the flanks and legs are separate, and are usually rolled up inside the fleece in packing it, though

in some sections they are sold separate as a different quality of wool, being of shorter staple than the fleece.

Sheep should not be sheared so early in the season as to be exposed to an undue cold temperature, neither should the process be delayed so late as to render the wool burdensome to them, or not to give the wool a good growth before autumn. They should never be exposed to rains or cold winds immediately after shearing, as they will be liable, from the great change of losing their fleece, to take cold and have a fever, or lung disease; hence, it will well repay the owner to take especial care to shelter the flock in unfavorable weather at this trying period. Even heavy dews will sometimes produce the same effect after the fleece has been removed, until they are accustomed to the change. If the weather be too hot or sultry after shearing, the sheep should have a good shady retreat in which to be protected from flies, and the hot sun, since the skin is then very tender, and will be liable to blister or be otherwise permanently injured.

It is well to have the sheep penned but a short time before shearing, as when recently taken from a fresh pasture with full, round bodies, this process is more easily accomplished than when lank and thin from empty stomachs. By the use of a machine, the process of shearing is greatly facilitated, and the wool is cut more evenly and closely than by hand, and also without clipping the staple a second time, as is often the case when shears are used. The following account of a recent sheep shearing in Australia, taken from an Australian paper, will give the farmers of this country some idea of the magnitude of sheep husbandry in that country:

"Edoes & Co., of New South Wales, had recently upon one of their sheep farms at Burrawand a sheep-shearing which lasted ten weeks and was concluded early in December, during which time no less than 206,123 sheep were shorn! To do this work 100 shearers, in addition to the 'station hands,' were employed, and in a single day 8,216 sheep were deprived of their fleeces. The aggregate yield was 2,512 bales, the gross weight of which was 466 tons. On previous occasions the same parties have shorn over 214,000 sheep; but this has been the largest amount of wool ever produced at a single shearing."

Packing the Fleece. — The manner in which the fleece is packed has much to do with its sale; hence, special care should be taken to have the packing done as neatly as possible. It should be clipped of all tags and filth, either before being taken from the animal or after. It should be laid on a perfectly smooth bench or table, with the outside uppermost; push the wool carefully together to make it somewhat compact; then turn the ends all in, such as the neck and legs, to make the ends straight, and double the sides over to the centre; if the loose wool is to be included (which is the usual custom), put them in the centre and roll from the end in a moderately tight package, and tie with good twine. This makes a neat, smooth package that can be readily handled and examined, as the inside of the fleece (or that grown nearest the skin), constitutes the outside of the package when rolled.

When the wool is to be shipped, it will be necessary to put the bundles in bags or boxes. They should be packed into as small a compass as possible, and the box or bag securely fastened, after which they should be weighed, and the weight and qulaity marked upon them. The tags can be prepared for sale by washing in strong soap suds, and pulling them to pieces until all the dirt is removed; after which rinse in soft water. Some recommend dipping them repeatedly in strong salt and water made as hot as the hands can bear, before washing. These should be packed separately as inferior wool, although they often make wool of medium quality, and would otherwise be worthless.

How to Determine the Age of Sheep and Lambs. — Although some breeds of sheep mature much quicker than others, and much depends upon the manner in which they are cared for, however, a few general rules may be given for determining their age, which may be regarded as sufficiently definite for all practical purposes.

At one month old the lamb has eight temporary front teeth, and three temporary molars on each side of the jaw; at three months a permanent molar is added to each of these three. At nine months the second permanent molar appears; at fourteen months the first two permanent incisors (nippers or cutting teeth) appear in the front of the lower jaw; at eighteen months the sixth and last molar tooth appears. A second cutting tooth appears on each side of the first pair; at twenty-one months two more cutting teeth appear; at twenty-seven months the temporary molars are replaced by permanent ones; at thirty months two more cutting teeth are added, and at thirty-six months two more cutting teeth and the last pair appear. There are then eight incisors and twenty-four molars or grinders, or thirty-two in all, and the sheep full-mouthed and mature.

The law of England has decided that a lamb becomes a sheep when the first pair of cutting teeth appears, which is at the age of fourteen months.

Professor James Law expresses his opinion on determining the age of sheep, as follows:

"The books on sheep have seriously misled flock-masters on this subject. Almost any sheep owner will tell you that after a year the sheep gets a pair of broad teeth yearly, and if you show that his own three-year-olds have four pairs of broad teeth, he can only claim that they are exceptions, and protest that they do not exceed three years of age. Now these cases are no exception, for all well-bred sheep have a full mouth of front teeth at three years old. Some old unimproved flocks may still be found in which the mouth is not full until near four years old, but fortunately these are now the exceptions, and should not be made the standard, as they so constantly are.

In Cotswolds, Leicesters, Lincolns, South Downs, Oxford Downs, Hampshire Downs, and even in the advanced Merinos, and in the grades of all these, dentition is completed from half a year to a year earlier. The milk or lamb teeth are easily distinguished from the permanent or broad teeth, by their smaller size, and by the thickness of the jaw-bone around their fangs where the permanent teeth are still enclosed. As the lamb approaches a year old, the broad exposed part of the tooth becomes worn away, and narrow fangs projecting above the gums stand apart from each other, leaving wide intervals. This is even more marked after the first pair of permanent teeth have come up, overlapping each other at their edges, and from this time onward the number of small milk teeth, and of broad permanent teeth, can usually be made out with ease.

Another distinguishing feature is the yellow or dark coloration of the fangs of the milk teeth, while the exposed portions of the permanent teeth are white, clear, and pearly. The successive pairs of permanent teeth make their appearance through the gums in advanced breeds at about the following dates: The first pair at one year; the second pair at one year and a half; the third pair at two years and three months; the fourth and last pair at three years. It will be observed that between the appearance of the first two pairs there is an interval of six months, while after this each pair comes up nine months after its predecessors. For backward grades, and the unimproved breeds, the eruption is about six months later for each pair of teeth, but even with them the mouth is full at three years and six months."

As a general rule, if well fed and kept in a thriving condition, sheep will shed their teeth faster, and *vice versa*.

Sheep as Fertilizers. — With respect to the agency of sheep in improving the fertility of the soil, we quote the following from the pen of Hon. John L. Hayes, of whom we have made previous reference in this work, and as one of the best authorities on sheep husbandry in the country:

"Sheep are the only animals which do not exhaust the land upon which they feed, but permanently improve it. Horned cattle, especially cows in milk, by continued grazing, ultimately exhaust the pastures of their phosphates. In England, the pastures of the county

of Chester, famous as a cheese district, are kept up only by the constant use of bone dust. Sheep, on the other hand, through the peculiar nutritiousness of their manure, and the facility with which it is distributed, are found to be the most economical and a certain means of constantly renewing the productiveness of the land. By the combination of sheep husbandry with wheat culture, lands in England which in the time of Elizabeth produced, on an average, six and a half bushels of wheat per acre, produce now over thirty bushels. For these reasons, the recent practical writers in the Journal of the Royal Agricultural Society of England pronounce that, while there is no profit in growing sheep in England simply for their mutton and wool, sheep husbandry is still an indispensable necessity, as the sole means of keeping up the land.

Experience in the United States leads to similar conclusions. Mr. Stilson, of Wisconsin, by keeping sheep, is able to raise his twenty-four bushels of wheat to the acre, while the average yield of wheat in Wisconsin is but ten bushels. There are cases in Vermont where sheep farmers have been compelled to abandon one farm after another as they became too fertile for profitable sheep growing. Mr. George Geddes, whom Horace Greeley used to regard as the highest authority on agricultural matters in the State of New York, and who has raised sheep for many years in connection with wheat, says that, with one sheep to the acre of cultivated land, pasture and meadows, he raises more bushels of grain, on the average, than he did when he had no sheep to manufacture his coarse forage into manure, and to enrich his pastures to prepare them for the grain crop; that the land is constantly improving, and the crop increasing in quantity; and that, while producing crops on less acres and at less cost than he did before he kept sheep, he has, *in addition, the wool and the mutton produced by the sheep.*

Mr. William Chamberlain, of Red Hook, Dutchess County, New York, celebrated as a grower of Silesian sheep, purchased, in 1840, a farm in that place of 380 acres, which had been used so long for selling hay that it was worn out. The hay crop, in 1841, was seventeen loads; forty acres of rye gave ten bushels to the acre; twenty-five acres of corn averaged twenty bushels to the acre; the rest of the farm pastured two horses, four oxen, and one cow. The land was so poor that it would not raise red clover. By using sheep as the producers and manufacturers of manure, he made this worn-out farm so productive that its crops would be satisfactory even in Ohio. The product, in 1866, was 600 tons hay; 40 acres of Indian corn, yielding 50 bushels to the acre; 30 acres of wheat, averaging 15 bushels; 30 acres of oats, 8 acres of roots, and the pasturage of 300 sheep, and of the teams, cows, etc., necessary to carry on the farm and to supply the families on it with milk and butter.

Mr. Chamberlain's plan, when he first commenced making manure by using sheep, was to spread it thinly, so as to go over all the surface he could, and make clover grass; and he said that when he had brought his land to where it would produce clover, improvement thenceforth was easy and rapid. The sheep not only gave a first impulse, but were all the time depended upon as the great manure-producing power.

The farmers of Connecticut in former times appreciated the fertilizing influence of sheep. In Goshen, Conn., the public roads were anciently laid out eight rods wide; and in these highways it was customary to pasture sheep, which were taken care of by a man and boy at the expense of the town. The yarding of the sheep at night that the manure might not be lost was let out at the town meeting. On the night of May 27th, preceding the cold summer of 1816, it was the turn of a certain farmer to yard the sheep for the night. He had no field which would hold the sheep—some 800 in number—except one planted with corn which had just come up. Preferring to sacrifice the corn rather than lose the manure, he turned the flock into his corn field. On that night the frost cut off all the corn in the town, and the sheep cut off the corn of the said farmer, who congratulated himself in the morning that he was no worse off than his neighbors. He soon found, however, that he was

better off. The sheep, by feeding on the corn saved it from the frost, and the droppings of the sheep in one night so enriched the field that it produced the largest crop of corn that had been grown in the town for years."

Sheep graze more closely and keep the pastures in much better condition than any other animal, and will do well where other animals would hardly gain a subsistence.

Wool and its Uses.—Unlike the culture of cotton and other textile materials, the cultivation of which is confined to certain localities of our country, wool-growing can be successfully practiced in every State in the Union and its territories, being suited to all soils and climates. The South and West are sections peculiarly adapted to this enterprise, while in New England it must of necessity be limited, owing to the density of the population and the small size of the farms in that section. In the South the season for winter feeding is much shorter than at the North, affording an opportunity to depend more upon pasturage in maintaining the flocks, while the well-sheltered valleys afford protection from the severity of storms in winter and induce an early growth of spring grasses. The infertile and worn-out lands can by this means be reclaimed to cultivation and fertility.

By the more general recognition of sheep husbandry as an adjunct of Southern Agriculture, for a few years, a marked improvement in soil, general agriculture, individual and State wealth must of necessity follow. The remarkable success attending wool growing in New South Wales, which is a region of excessive heat, proves what can be accomplished in such climates. The admirable facilities for wool growing in the Western States and Territories, and the success already attained in it there,—where it is but yet in its infancy,—gives promise of what may yet be accomplished in this direction in the future.

In a recent article on the Wool Industry in our National Economy, Hon. John L. Hayes says,—after referring to pastoral sheep husbandry as of the first importance as a means cf settling new territories:—

"The relations of domestic wool to domestic manufactures are equally conspicuous and important—the rule being that the characteristic wool manufactures of the leading nations have been determined by the abundance and peculiarities of their raw material. Turkey makes but few, and exports no cloths, but her carpets and rugs, made from the wool of the barbarous sheep, are sought everywhere; England, the home of the combing-wool sheep, was the inventor of the countless dress fabrics into which the fleeces enter; Germany produced the electoral fine-wool sheep, and her light, fine broad-cloths dispute with all rivals for the markets of the world; France created the Merino combing-wools, and from them established her prestige in the fabrication of the luxurious dress goods which in their infinite variety contribute to the adornment of the female world.

The wool manufacture of the United States is dependent upon domestic wool production. 'The two branches of wool industry have always stepped together, though unconsciously quickened or retarded by the same influences. As the flocks spread in the new State the mills were planted in their midst—not clustered in a few centres, as in Europe, but broadly scattered, like sheep feeding in a wide pasture.' The more prominent wool-growing States have woolen mills as follows: California 10, Illinois 99, Indiana 157, Iowa 98, Michigan 55, Missouri 57, Ohio 187, Oregon 9, Wisconsin 67—all using American-grown wool, and mostly produced in their immediate neighborhoods. 'It is safe to say that not one of these mills would have been established but for the contiguous flocks, and if forced to seek imported wool, each one would stop.' But consumption of domestic wool is not confined to Western manufactures. Manufacturers prefer American to foreign wool. The census of 1880 indicates an enormous preponderance of the domestic article over the foreign. Two reasons are assigned for the superiority of American wool. The first cause is a physical one—our characteristically dry climate. The second is a moral one—as a rule the farmer is his own

shepherd, and brings to the care and improvement of his flock an intelligent oversight that may in vain be looked for in any of the countries whence clothing wools are exported."

Classes and Grades of Wool.—Wool is divided according to the length of its staple and fineness; thus we have the clothing wool, the combing, and the carpet or coarse wools. It is divided by governments for tariff and wool merchants into these three classes, each of which have their respective grades. Wool merchants separate each division into as many classes or grades as there are distinct qualities of staple in each division, to suit the purchaser. Manufacturers take the fleeces and separate them into as many classes as there are distinct qualities of staple in each fleece, according to its length, color, lustre, fineness, etc.

Clothing wool is generally divided into three classes, viz.: fine, medium, and coarse.

The superfine, or finest of the fine wool, is essential to the manufacture of the finest faced goods, such as broad-cloths, doeskins, etc. Fine wools are also necessary for making various other kinds of fabrics, such as cassimeres, overcoatings, and the finer qualities of gentlemen's apparel,—shawls, flannels, cashmeres, merinos, and other varieties of ladies' dress goods, etc., besides all mixtures of wool with shoddy; the largest and finest wools being used to carry wool substitutes.

Combing-wools are used for shawls, fancy knit goods, worsteds, alpacas, mohair lustres, damask for furniture, all kinds of reps, etc. The combing of wool consists in drawing out the fibres straight and parallel; then twisting into threads called worsted, the ends in spinning being covered, making the yarn smooth and lustrous. The staple is generally from five to eight inches long, having a few spiral curls or serratures with distinct lustre.

The wools of the Cotswolds, Leicesters, Lincolns, and Down breeds are especially adapted to combing purposes.

The coarser the staple, the longer it generally is. Combing wools are classed into fine, medium, and coarse grades.

Carpet or coarse wools are used for the warp of ingrain carpets, two or three-ply, and the filling of Brussels. The longest is combed for this purpose, while the shorter-stapled coarse wool is used for the carpet fillings. It is also used in the manufacture of blankets, rugs, etc.

The value of all kinds of wool is determined by its strength, lustre, working qualities, and shrinkage. Sheep that are not well cared for produce a wool of inferior quality, being coarse and uneven in fibre, consequently wanting in strength and the other qualities essential to rendering it valuable. Hon. J. L. Hayes, who, in company with able foreign and American experts, had an opportunity, in his official capacity, to study our own wool products in comparison with those of other countries at the International Exhibition, says:

"In woolens proper, we make, with no exception now occurring to us, all the classes of fabrics made in the best European mills. The same may be said of hosiery. In worsteds, we make all mixed cotton and wool dress goods — the classes of dress fabrics entering into most general consumption, and therefore of the first utility — and many all-wool worsteds. We do not make the all-wool merinos and cashmeres, which are not made successfully even in England, nor some other fine wool novelties in dress goods, which are obtained wholly in France. Their use is confined to the wealthy and fashionable classes. Some we have very recently attempted with signal success — such as the all-wool merino plaids and matelasses — and shall doubtless make them all, except possibly the merinos and cashmeres. In carpets we produce every variety, except the Persian and Turkish and the Aubusson hand-made carpets, used only by the opulent classes.

In woolens, we are inferior only in broadcloths, and that not in quality but in quantity of production, the general disuse of broadcloth, except for dress suits and by the wealthy, making it more profitable for our mills to run on goods in general demand. That we have no want of capacity is shown by the product of the few mills who still pursue this branch

of manufacture, and by the fact that the finest sample of broadcloth shown at the Exposition, though not for competition, was made in this country twenty-three years ago. In blankets and flannels, our products are absolutely unequaled by any made abroad. In fancy cassimeres and worsted coatings — the great articles of consumption all over the world — we equal any, surpass most, made abroad, in texture, finish, and beauty of design; foreign manufacturers eagerly seeking samples for imitation in their mills. Our thicker cloths for overcoatings suffer nothing in comparison with those made abroad.

In dress goods, there was little opportunity to make comparison, as Bradford, the principal competitor in classes of goods made by us, did not think it wise to enter the field. But the command of our own market against foreign competition settles the question as to the quality of our goods. In carpets of the cheaper and medium qualities, up to two and three-ply ingrains, we are without competition, making the cheaper kinds so abundantly and cheap, that no home, however humble, need be without this most characteristic of household comforts. The extent of their use in our homes was a subject of surprise to our foreign visitors. The higher classes of tapestries and Brussels, and still higher, of Wilton and Axminster, in taste of design and perfection of texture, were absolutely equal to the best foreign samples; and, judging from the length and closeness of the pile, surpass them in wearing qualities. In this department, we have nothing to learn abroad.

That system of production and consumption proves itself to be most economical to the people which makes consumption the most *abundant*. That our people are the most abundantly and substantially clothed of any in the world needs no demonstration. It is shown in our army, and the vast superiority of its cloths over those furnished to any foreign troops. It is shown in what foreigners at Philadelphia so much admired — the beauty of the uniforms of our volunteer troops. It was shown in the costumes of the millions at the Exposition; and, especially, in the absence of all distinction of garb in the people of the seaboard cities, and the remotest interior. The personal appearance of a population indicates its social condition; and thus the woolen industry performs its last part in the national economy by abolishing the outward distinction of class, and cultivating the personal self-respect of the individual citizen."

Sheep Ranches. — The ranches or extensive farms devoted especially to stock-raising in many of the far Western States and Territories, sometimes comprise hundreds of thousands of acres, furnishing pasturage to thousands of sheep, which under the charge of one or two ranchmen and their faithful shepherd dogs, are pastured during the day and returned to the corrals or inclosures, for protection at night. The leader of the flock is often a Mexican goat.

One of the first requisites in establishing a sheep ranch is to find a good supply of water and have it centrally located in a district of good pasturage, where the ranchman proposes to graze his sheep. The usual allowance of range is five acres for each animal; consequently, a very large tract of land is required for keeping several thousand sheep. They are always corralled at night for protection against wolves and other animals. Cattle and sheep should never be kept together on the same ranch, as the sheep eat the grass down so closely that nothing is left for the cattle, and they also leave an odor which is offensive to the latter. The cost of managing sheep is greater than that of handling cattle, yet the returns are generally quicker and larger, since a herd of young cattle begins to yield an income only at the expiration of about three years, while the sheep yield a crop of wool the first summer they are driven upon a ranch, and the increase of numbers is much larger. They are also easier to take care of than cattle; hence, the life of a shepherd is less laborious than that of a cattle herder.

Sheep should be herded both summer and winter in separate flocks of not more than two or three hundred each. When the pasturage in one section of the ranch is closely cropped, they should be driven to another, and so on to different localities in rotation, to constantly

secure fresh grazing grounds. It is desirable to have sheds in winter as a protection against severe storms. A large percentage of sheep in many of the ranches are owned by persons who do not manage them themselves, but who take, as an associate, a man of integrity and experience in the business, but destitute of capital, to whom the entire charge of the flock is given, and for his services the usual allowance is one-half the increase of the flock. While many make a remarkable success in this business, others meet with reverses, as will be seen by the following from one of our leading journals:

"To illustrate what can be really done with sheep in Montana, the experience of 'Judge Davenport' is related. Four years ago last July, the Judge bought 1,000 ewes, which cost him in the neighborhood of $3,000. These he put in charge of a young man, who was to take them on a range, care for them, pay all the expenses of the band, and to receive as his share one-half of the wool produced and one-half the increase of the flock. At the end of four years a settlement was to be made, and Judge Davenport was then to receive back 1,000 of the best ewes which the band contained. The settlement was made last July. In the meantime Judge Davenport had received for his share of the proceeds of the wool, $6,500, and for his share of the increase, $8,000. The profits of his investment of $3,000 for four years were, therefore, $14,500, or $3,625 or 121⅚ per cent. a year!

During the same year other men made only 50 or 60 per cent. on their sheep, and some, who, from inexperience or bad fortune met with heavy losses, perhaps not more than 25 per cent. Absolute losses, it is said, are very rare if a man sticks to the business for a period of three or four years. In illustration of this the case of one man who, driving a large band of sheep from the South a year or two ago, was caught by the winter in an unfavorable place, and lost one-half or two-thirds of his flock, is cited. This unfortunate individual at the end of three years, when he came to balance his books, found that the remnant of his band had done so well that his profits had been about 25 per cent. a year on his original investment."

Life on the Colorado sheep ranches is thus described by a correspondent of one of our leading agricultural journals: —

"There is a novelty and charm about this life which attract very many from the older States, and one is constantly discovering in the rough herder's garb men of education and culture. They are fond of the freedom and exhilaration of this mode of existence, which also promises health, wealth, and adventure. Very many of the herders or hired men are fresh from college; youths who are serving their apprenticeship in the occupation of sheep-raising. Others come here from the Eastern and Middle States to engage in mining operations. They are unsuccessful, become straightened for money, and take to herding because herders are in demand. Their wages vary from fifteen to thirty dollars a month and board, according to capacity and experience. Many not only remain with their sheep during the day, but sleep near them in the corrals at night, as a protection against wolves. On three successive nights since we have been here, these wolves have made a descent upon the corral, killing several lambs. In the early days of Colorado sheep-raising, the herders were accustomed to camp with their flocks wherever night overtook them. This, however, was found to be a dangerous practice, inasmuch as the sudden storms of the Colorado plains would blind and scatter the sheep, and often lead to great loss. Sheep invariably go before a storm. Sometimes they cannot be checked, but will push on to certain destruction. We recall one instance where three thousand sheep in southern Colorado, overtaken at night by a sudden storm, blindly followed their leader over a precipice, and perished in the waters below, not one escaping. Now the ranchmen have their sheep corralled at sunset, instead of keeping them out on the plains. Though generally manifesting but little intelligence, they invariably display much sagacity in wending their way toward the corral, which they know will afford them protection against wolves, and keep them warm and comfortable. The sheep soon come to know the herders, and manifest as much affection for them as sheep are capable of. It is not well, however, to have them become too tame, because they hang back and do not drive

well. The thrifty owner has his sheep out of the corral and upon the plains by daylight. They feed until about ten o'clock, and then bunch up, or form a compact mass, until four o'clock, and from then they feed until driven in at dark. They eat gramma, buffalo, wire, and bunch grass. Wild hay is cut and stacked for feeding in winter, so that they may not want for food should there be a heavy fall of snow. The herders generally have horses of their own, which subsist on prairie grass, are very much attached to their owners, and become wonderfully skilled in managing sheep. Give them the rein and they will gather in and keep the flock together with as much dexterity as the shepherd's dog who accompanies them. The dog is an essential part of the outfit, being a companion to his owner, and exercising a constant vigilance for the safety of the flock. Herder, horse, dog, and sheep together make a very picturesque appearance as they move over the plains.

The flocks, comprising Mexican sheep and their increase from Merino bucks, generally number from 1,000 to 3,000. During the winter the larger flocks are generally divided in order to insure better feeding and better protection. One herder can readily manage 2,500 sheep, but he has to have his wits about him constantly. The leader of the flock is generally a Mexican goat, whose prowess is recognized by the whole herd, and whose prominent figure enables him to be easily seen both by the sheep and the herder. The leader in the ranch we visited was the famous stag 'Christo.' This venerable goat has a history. He was brought from New Mexico many years ago, has been a leader for several different flocks, and now in his old age, though so decrepit as to travel at times with difficulty, has no idea of surrendering his leadership, but is invariably found at the front when necessary. The whole expression of his countenance, his dignified bearing, even his walk and the firm manner in which he plants his front feet, indicate that he realizes his responsibility and feels his importance. Old Christo shows an intelligence at times which is little less than human. For example, he snuffs the approach of wolves from afar, and often, when the unsuspecting sheep and lambs about him are sleeping in fancied security, he wakes the ranchman to make known the approach of the enemy. When no herders were sleeping with the sheep, he has recently, upon two occasions, taken the entire flock around the ranchman's house in the middle of the night to arouse him and secure protection from the advancing wolves. Christo, who is twenty-four years of age, will probably be gathered to his fathers soon, and he has so strong a hold upon the affections of his present owner that he will be buried with due honors.

The Mexican sheep, as a general thing, are purchased about the first of October. The bucks are turned in with them in December, and the lambing season begins about the middle of May. Shearing begins about the first of June. The Mexican sheep shear from two to four pounds, and improved sheep from four to eight pounds. Of course there are exceptions; for example:—The Willard Brothers, at their shearing match last year, clipped thirty-two and one half pounds of wool from one Vermont ram, which brought twenty cents a pound. In shearing sheep great care must be exercised not to begin too early, on account of late storms. The shearers are paid from five to eight cents a sheep for their work. One man can shear from twenty to seventy sheep in a day. Mexican wool brought last year from sixteen to twenty cents a pound (prices were much less this year), according to the absence or presence of 'kemp,' a hairy, valueless substance. As sheep improve, the quantity of kemp gradually diminishes. The fleece of the native Mexican sheep is a coarse carpet wool, but as the flocks are improved by the introduction of Merino bucks the quality of the wool is improved, until many of the ranchmen now claim that it is fully as good as that grown in the Eastern States. They further maintain that when their improved sheep become disassociated in the public mind from the native Mexicans, their wool will justly command as good a price as is paid for Eastern fleece. Owing to the scarcity of water, sheep are rarely washed in Colorado."

There are many attractions in the wild life of the ranchmen, and but few prettier sights are

presented to his vision than those represented by the various groupings and gambols of the young lambs ranging from two to six weeks old, in flocks of from two hundred to three hundred each. A recent writer gives the following graphic description of such scenes : —

"With the true gregarious instinct of their species, they range in flocks, or gangs, and are fuller of life, animation, agility, and grace than any mortal thing on earth. To see a snow-white squadron, two or three hundred strong, suddenly make a dash from a state of repose, and scamper, like mad race-horses, along the edge of a precipitous bluff, until the mad gallop of their twinkling feet is lost in the distance—perhaps a good half-mile away—and the green herder rises from his couch on the green grass, and girds up his loins preparatory to going after the runaway rascals—when, presto! here they come again, leaping, and glancing, and darting, and stamping, right back to the place from which they started, and suddenly stop, and look, with wonderful, inquiring eyes, upon the astonished herder; and, before he knows what to make of it, are off on the same 'racket' again, kicking and flinging and capering and pushing each other to the edge of the bluff, which, however, they are far too well posted to fall over. There may be prettier sights in the animal world, but we have yet to see them. Then how they stretch themselves upon the grass and lie in the warm rays of the life-giving sun, sleep till they get tired of sleeping, and then make a break for suction, dividing their time, like good, natural infants, between the two great props of physical existence, sleeping and eating; while their mothers—good, staid, sober, honest souls—forgetting, perhaps, that they were once lambs themselves—crop, contentedly and assiduously, the juicy pastures, and keep strictly to the real business of life—their life—viz., converting as much as possible of the vegetable world into mutton for the use of somebody else—a worthless coyote, or a worthless man; but yet recognizing the grand fact that their children are about, and not getting too far away, as they would be prone to do under other circumstances."

The largest flocks of sheep in the world are to be found in Australia, some individuals there owning more than half a million sheep. The flock of Mr. Robert Campbell, residing there, numbers 300,000; another owned by a private firm consists of 200,000, while flocks numbering from 50,000 to 80,000 owned by single individuals are not uncommon. The figures given above are from the published official tax-lists of Australia.

Wool Eating.—This pernicious habit is occasionally seen in individuals of a flock, and if not checked in proper time will be liable to extend to large numbers, and sometimes by its effects upon the stomach results in the loss of animals; it is also an injury to the fleece of the flock. It does not seem to be affected by medical treatment, and cannot be really treated as a disease. It appears generally to begin with a single animal, and gradually spreads by way of imitation. The usually sure method of stopping it is to early remove all such offenders and keep them in entire isolation until they forget the practice, or if all other means fail convert them into mutton. Where a valuable sheep that the owner is unwilling to lose is addicted to this habit, it will pay the trouble of a few weeks isolation, rather than killing the animal. Sheep will sometimes form the habit of wool eating when out in a severe snow storm where food is scarce, and will continue it afterward when they have an abundance. The following remedy is given by an experienced wool grower in Colorado as generally effectual in curing the evil. Mix together equal parts of powdered chalk and common salt, and place a liberal quantity in different places on boards or in troughs in the sheep pen where they can have free access to it, and in about two weeks the habit will be abandoned. We have never tried this remedy ourselves, and therefore cannot vouch for its value, but presume it may prove efficacious in many instances. A mixture of cayenne pepper and lard applied to the wool is also a good remedy, since, having tasted it once, they rarely prefer a second dose.

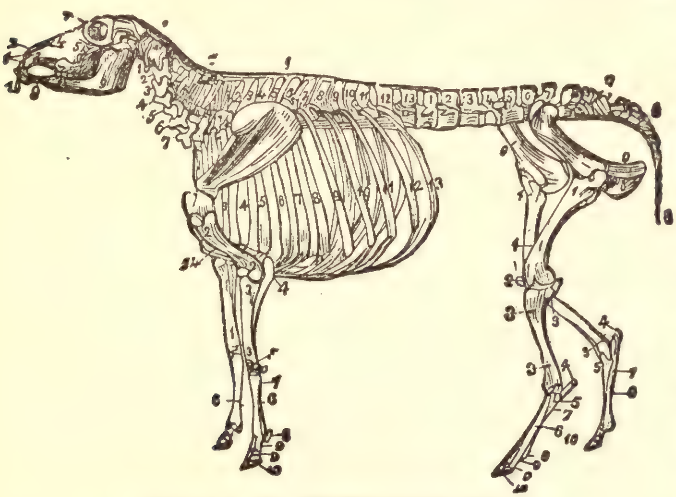
Cotted Wool and its Causes.—It sometimes happens that an occasional fleece in a flock will become more or less cotted, often to the extent as to be nearly or quite worthless. This condition may be due to several causes. If sheep are too much exposed to the storms or inclemency of the weather, and allowed to lie in damp places, are poorly fed, or otherwise

ill treated to the extent that their general health suffers, the skin will of course participate in the evil effects of the imperfect nourishment of the body; hence, the wool will be supplied with a less amount of the liquids from which it derives the elements of growth, and receiving less of the oily secretion, called yolk, from the minute glands that supply it, withers, becomes hard and dry, loses its softness and elasticity, and becomes matted into inextricable masses, while on the backs of the sheep. If there is any tendency to scab or skin eruptions, the difficulty will of course become greatly aggravated. The only remedy for this difficulty is to keep the sheep in good condition by observing the sanitary laws necessary to that result. Good food in sufficient quantities, plenty of pure air and water, clean, dry yards, and a warm, dry place to sleep at night in winter, and dry land for pasturage in summer are the essentials. No sheep can be healthy where the soil is so damp that the hoofs are constantly wet. To avoid the cotting of fleece, therefore, implies the avoidance of all the causes of disease and lack of thrift in a flock, since by good care and perfect health the fleece will receive from the sebaceous glands which secrete the yolk a sufficient supply of that element to render the wool soft and elastic, and its cotting impossible. When the wool has become cotted, it will generally be found impossible to restore it, but by improving the general system and skin of the animal the future growth will become natural and strong.

Skeleton of the Sheep. — The following explanation will be found of value in giving the location and names of the bones of the sheep:

Beginning with the head, the references to cut of skeleton show: 1—The intermaxillary bone. 2—The nasal bones. 3—The upper jaw. 4—The union of the nasal and upper jaw bone. 5—The union of the molar and lachrymal bones. 6—The orbits of the eye. 7—The frontal bone. 9—The lower jaw. 10—The incisor teeth or nippers. 11—The molars or grinders.

THE NECK AND BODY.—1, 1—The ligament of the neck, supporting the head. 1, 2, 3, 4, 5, 6, 7—The seven vertebræ, or bones of the neck. 1–13—The thirteen vertebræ, or bones of the back. 1–6—The six vertebræ of the loins. 7—The sacral bone. 8—The bones of the tail, varying in different breeds from twelve to twenty-one. 9—The haunch and pelvis. 1–8—The eight true ribs with their cartilages. 9–13—The five false ribs, or those that are not attached to the breast bone. 14—The breast bone.



SKELETON OF LEICESTERSHIRE SHEEP.

THE FORE LEG.—1—The scapula or shoulder-blade. 2—The humerus, bone of the arm, or lower part of the shoulder. 3—The radius, or bone of the forearm. 4—The ulna, or elbow. 5—The knee, with its different bones. 6—The metacarpal or shank-bones; the larger bones of the leg. 7—A rudiment of the smaller metacarpal. 8—One of the sessamoid bones. 9—The two first bones of the foot; the pasterns. 10—The proper bones of the foot.

THE HIND LEG.—1—The Thigh bone. 2—The stifle joint and its bone, the patella. 3—The tibia, or bone of the upper part of the leg. 4—The point of the hock. 5—The other bones of the hock. 6—The metatarsal bone, or bone of the hind leg. 7—Rudiment of the small metatarsal. 8—A sessamoid bone. 9—The first two bones of the foot, the pasterns. 10—The proper bone of the foot.

It will be seen that the general anatomy of the sheep corresponds to that of the ox. In the limbs we find the number of joints the same in the horse, ox, and sheep Beneath the fetlock, however, the four bones are doubled in the sheep.

DISEASES OF SHEEP.

SHEEP are naturally healthy, and except under conditions of culpable neglect, diseases rarely occur spontaneously; hence, sheep that are properly cared for have but few diseases, while those that suffer neglect and abuse, are liable to many. The sheep is an inhabitant of every climate from the torrid to the frigid zone, and seems to readily adapt itself to every country and temperature.

It is stated by good authority that the digestive system of the sheep is the most powerful of all domestic animals; they are also naturally among the most healthy, and we are well satisfied that there need be but little sickness in any flock, if the proper means of prevention are observed. The old adage that "an ounce of prevention is worth a pound of cure," is admirably applicable in maintaining a flock of sheep in a healthy condition. As a rule, we do not believe in the practice of dosing animals.

The two most prevalent, as well as most dreaded maladies to which the flocks of our country are most exposed, are foot-rot and scab. One sheep infected with either of these diseases is liable to endanger all the others by contagion; consequently, the only safety for them is in excluding from the pastures, yards, pens, paths, and the vicinity even if possible, all the ailing members of the flock. A poor and unthrifty condition is highly conducive to the contraction and spread of disease among sheep, and such a flock is more difficult to successfully treat in its extermination, since a well fed, vigorous sheep possesses more vitality and power to counteract and throw off disease, than one ill cared for, and the flock-master who provides for his sheep best in health, has fewest losses from maladies of any kind.

We would also impress upon the mind of every flock owner, the importance of separating all ailing sheep from the well ones, and maintaining this isolation until the animals are completely cured. Valuable flocks have no doubt been often lost through neglect of this very essential practice.

Proper care consists in sufficient and nutritious food, plenty of pure water and air, salt at least once a week, dry grounds, not overcrowded at any season, well ventilated and dry sheds in winter, and protection from the cold fall and spring rains.

Abortion.—Although abortion can scarcely be called a disease, still measures can be taken for its prevention which should be known to the farmer, since when it has taken place once, it is more liable to occur a second and subsequent times; and to avoid this tendency in the animal, it should carefully be guarded against at all times as far as possible. Young ewes are especially liable to this tendency, and it often results from their being crowded by the older and stronger sheep; it is therefore well to keep the ewes that are in lamb for the first time in a flock by themselves, where this injurious crowding will be avoided; for it is a noticeable fact that with all animals, even the gentle and naturally peaceable sheep, the stronger will domineer over the weaker, greatly to the disadvantage of the latter.

Aborting is also often due to an overfeed of cold, succulent food, stabling without food, and turning to frozen grass when hungry; being chased or pushed about by other animals; slipping on the ice; stabling without water, and then turning them where they can gorge themselves with ice-water; constipation of the bowels, often produced by too sudden a change from pasture to hay; green to dry food will also cause it. By observing previous directions given in these pages relative to the management of sheep, these causes of aborting may be avoided, and the number of lambs largely increased in the flock.

Brain Disease.—This is by no means an uncommon disease in flocks, but it usually occurs in isolated cases. The symptoms are, loss of appetite, with hanging of the head, the eyes glazed and watery, the animal looking stupid, and often, to all appearance, nearly blind.

It will run against obstacles, sometimes pressing against them with the head for some time. Some attribute this disease to the exciting effects of feeding too much corn.

Feeding with bran and roots for a time, with good hay, may remedy the trouble; also 1½ ounces of sulphate of magnesia, repeated after two days. The dose should be dissolved in a little water and turned down the animal. If taken before the disease is far advanced, this will usually prove an effectual remedy, but the recovery from this disease will always be gradual. Constipation should be avoided.

Catarrh.—This is another term for cold in the head, and is caused by taking cold in various ways, such as exposure to storms (cold rains being the worst), getting chilled after running, being in a strong draft of cold air, lying on the wet ground, etc. It consists of an inflammation of the mucus membrane of the nostrils and windpipe, and in the acute form often extends to the lungs, which constitutes lung fever, when they will often die notwithstanding the care that may be bestowed upon them. Sometimes they will gradually loose their vitality, waste away, and drop off before spring. With this, as with most other diseases, the prevention is more easy than the cure. Take good care of your flock and they will not contract the disease.

A good remedy for catarrh is to smear the noses of the sheep with tar, using only that which is good and fresh, and also put some along the bottom of the trough in which their grain is fed to them. By scattering their grain over the tar they will lick up some of it in eating the grain. Particular attention should always be given to keeping the flock under cover during rainy weather, and in keeping their stables and sheds well ventilated at all times.

Another very good remedy is to take equal parts of pulverized rosin, flowers of sulphur, and salt, and cover the bottoms of their feeding troughs with it. The sticky nature of the rosin, combined with the moisture of the salt, causes the sulphur to adhere to the noses of the sheep, and sulphur is one of the best remedies for catarrh. In this way they will get a direct application to the nose every time they eat.

Sulphur, mixed with salt, in the proportion of five pounds of salt to one of sulphur, is considered a good remedy by many flock-masters. It should be placed in their feeding-troughs, or places where they can have easy access to it. Some sheep-owners give their well flocks this mixture every week or two.

Sulphur has many valuable properties that recommend its use to keepers of sheep. It is a mild laxative, and valuable for use in hemorrhoids or piles. It induces perspiration, and passes readily through the pores of the skin, and is also an exterminator of parasites.

In severe cases a dose of podophylin as a physic, followed by a mild dose of cinchonia every three hours afterwards until five of the latter doses are taken, will usually prove beneficial. This can be repeated the following day, if necessary. The dose for a sheep is twice the quantity required for a man. The podophylin acts directly upon the liver, and equalizes the circulation.

Choking.—When obstructions lodge in the throat which the animal is unable to dislodge, a little olive oil or melted lard turned down will usually enable a person to move the obstruction up or down with the hand from the outside. (See directions for this difficulty in the Cattle department.)

Colic.—This is usually very violent and distressing; the animal having at intervals paroxysms of severe pain. It will stretch itself, groan, twist its head, and frequently get up and lie down again. It is generally caused by drinking a large quantity of cold water when heated; improper food, etc.; and is sometimes the result of constipation produced by the animal's being confined exclusively to dry food for some time. Unless relief is soon obtained it often results in the loss of the animal.

Give, as soon as possible, an ounce of epsom salts, dissolved with warm water, mixed with an even tablespoonful of ginger (in powder), and a teaspoonful of the essence of peppermint. A dose of the salts alone will often effect a cure; so will also a good dose of castor or linseed oil, or even melted lard; but the first prescription recommended is to be preferred. For a half-grown lamb one-half this dose will be sufficient.

Diarrhea.—This is frequently induced by taking cold, or by the general derangement of the digestive organs, caused by improper food. It is also frequently caused by a sudden change of food, such as from dry hay and grain to grass. Sometimes a change to dry food for a time, followed by a gradual change to grass, will remedy the evil. Lambs are more liable to this trouble than sheep, and it more frequently proves fatal with them than with the latter.

For lambs, especially if mucus is passed with the evacuations, a gentle cathartic is advised, such as a half drachm of rhubarb, or an ounce of linseed or castor oil, or a half ounce of epsom salts, either of which are good for the purpose. After the physic has taken effect, follow it immediately with one-fourth of an ounce of prepared chalk in half a pint of warm milk. This will usually effect a cure, but if it does not, repeat it once a day for two or three days.

Some sheep-owners use a little ginger or essence of peppermint mixed with the chalk preparation; a half teaspoonful of each would be sufficient for a half-grown lamb.

Dysentery.—This disease differs from diarrhea, as it is accompanied with fever, and the evacuations are bloody and offensive; there is also loss of appetite. We would recommend first, a couple of doses of the linseed or castor oil (of one ounce each), the one to be taken at morning, the other at night, which in a few hours will be followed by one-half an ounce of prepared chalk in a half pint of warm milk, adding from twenty to thirty drops of laudanum, and the same of Jamaica ginger, or a teaspoonful of ginger in powder. If checked too suddenly, a fever or inflammation of the bowels will be the result. One-half of the above will be an ample dose for a half-grown lamb; if younger, the dose should be proportioned accordingly.

Garget.—This usually occurs from the ewe either losing her lamb, or when the udder has not been properly relieved of milk by the lamb. Whenever there is a tendency to inflammation of the udder from loss of lamb, the ewe may be suckled by another lamb, or milked a few times, never taking quite all of the milk, and increasing the intervals between milking. The udder will usually, with this treatment, become soft in a few days. A few doses of saltpetre of about twenty grains each will assist by exciting the action of the kidneys.

Bathing the udder in cold water is also a good remedy when much soreness and inflammation exists. If there are any feverish symptoms, a dose of epsom salts (one ounce) will generally give relief.

Grub in the Head.—The bot fly of the sheep does not deposit its eggs in the locality of the animal chosen by the bot fly of the horse or ox for this purpose; the bot of the horse being usually found in his stomach; that of the ox beneath the skin on the back and quarters.

The bot-fly of the sheep (*Oestrus ovis*), sometimes called the gad-fly, lays her eggs about the nasal opening, and the larvae or young at once make their way up the nostril and finally reach the cranial sinuses, where they attach themselves by means of two little hooks growing out of their heads; they remain in this manner until they become full-grown larvae, when they again make a passage by way of the nostrils, down from the head, and penetrate the loose soil, if they chance to drop upon the ground where the soil is sufficiently porous to admit them. They remain in the ground, going through a series of changes similar to the bot of the horse or ox, and after a few weeks emerge from the ground a young bot-fly. It can readily

be seen how the larvae of the sheep bot can, by its traveling about and attaching itself to the delicate and sensitive membrane of the sinuses, create a vast deal of irritation and suffering, and not unfrequently sufficient to cause the death of the animal.

A sheep-owner informed the writer that not long since he lost a fine-blooded ram from this difficulty. A post mortem-examination resulted in finding two large grubs or worms in the head of the dead animal; one somewhat larger than the other, the larger being over half an inch long. They were quite tough, and when he attempted to divide them with a hard piece of wood, he failed and was obliged to use a pocket-knife to accomplish it. When sheep are attacked by this fly, they will crowd together, keeping their heads down near the ground, or if alone will push the nose against the ground in order to prevent them from alighting near it. Prevention, with this, as well as other ills, is the best course to pursue, and is commonly accomplished by tarring the nose of the sheep.

Some sheep-owners, in addition to this precaution, provide a dark house in the pasture into which the sheep can run when attacked by the fly that deposits the eggs, as the fly will not enter a dark place, and the sheep will instinctively seek it as a protection, and will come out to graze toward evening, after the flies have disappeared. Bromo-chloralum mixed with an equal quantity of water injected into the nostril is used with good effect by many sheep-owners. It should be injected until it brings out the larvae. Plowing furrows in the pasture where the sheep are kept occasionally in July and August, the time when the fly deposits its eggs, is often practiced; this gives the sheep an opportunity to bury their noses in the mellow earth whenever the fly attacks them, and thus prevent the deposit. Some say that the larvae are sometimes dislodged by blowing tobacco smoke through the stem of a pipe into the nostril. This can be done by covering the bowl of the pipe with a cloth, and forcing the smoke through the stem.

Hoof-Rot.—This is one of the most contagious and troublesome diseases with which sheep are affected, a single sheep often ruining an entire flock. It is most common with sheep that are kept on wet lands. The disease attacks the foot where the hoof unites with the bony structure and in the cleft between the hoofs. If not given prompt attention, it suppurates, the whole hoof is at length involved, and becomes so painful that the poor creatures sometimes hobble about on their knees; finally the hoof comes off, and the sheep are lost. Maggots sometimes infest the hoof before this stage is reached. This disease is supposed to be caused by an undue amount of moisture under the feet of the animals which softens the hoof, causes an inflammation and a consequent decay of the tissue. Dr. J. N. Navin, in an address before the Indiana Wool Growers Association, gives the following explanation of the cause of this disease:

"Between the hoofs of the sheep a small aperture may be seen, called the biflex canal, whose office it is to secrete an oily fluid for the purpose of lubricating the hide between the hoofs, it being called into action by every step the sheep takes in providing its food; therefore when perpetually wet or constantly dirty the parts swell, and this secretion already spoken of is stopped or retarded, therefore not only is the hide deprived of the oily secretion, but the secretion itself becomes an irritant of the glands which secreted it; therefore inflammation of the parts is the consequent result, hence foot rot, which, unless retarded and remedied very soon, destroys not only the hoofs, but the glands, and perhaps the coronary border which secretes the hoofs."

The first symptom of this disease is a lameness in the foot, and if properly attended to in the first stages can be cured. There are various remedies; but the first thing necessary is to remove them to dry pastures so that the remedies may prove more effectual by adhering to the feet. Before applying any wash, the dry or dead parts of the hoof should be pared off. This should be done by a sharp knife carefully, and by a skillful and experienced operator. No more of the hoof should be cut than absolutely necessary to remove what

covers the diseased portions of the feet, and if properly done, no bleeding will result from the operation. An unskillful, careless operator may do more damage in cutting than the disease, and it should be borne in mind that what is necessary at this point is skillful surgery, not butchery.

Various applications are recommended by experienced wool-growers. A gentleman of large experience in sheep-rearing in Australia, states that he has never found anything equal in its good effect to the arsenic trough. The trough should be large enough to hold two or three sheep standing, and the solution contain three ounces of arsenic to a gallon of water, and about an ounce of salt. It should be as hot as one could bear the hand for an instant, and three or four inches in depth in the trough, just deep enough to well cover the hoof. The sheep should be required to stand four or five minutes in this bath, by being held by the head, keeping two or three sheep in at a time; in this manner two or three persons can run through a large flock in a comparatively short time.

The wash should be kept quite warm by repeated additions, or dropping a hot iron into it. The arsenic hardens the hoof, and not only destroys the germ of the disease, but acts as an antiseptic. Fine, dry weather is necessary to the operation. He also says that if sheep are put through the arsenic bath every three months, lameness will be a rare exception in any flock.

Another wash highly recommended by good authority, is a solution of blue vitriol and water as hot as the hand can endure for an instant, twelve pounds of vitriol being sufficient for a hundred sheep. The bath should be sufficient to well cover the hoof, the hoofs of the animals having been first pared according to the above directions. The hot liquid quickly penetrates to every cavity of the foot, and will produce more marked results than merely wetting. The animals should stand in it from eight to ten minutes. Another method sometimes resorted to is to pare the hoof as in case of the wash, and smear the foot with a mixture of the following proportions: powdered blue vitriol one pound; verdigris one-half pound; linseed oil one pint; pure tar one pint. This preparation will stick to the foot, and is a very effectual remedy; however, we do not recommend it as superior to the above hoof baths. After treatment of any kind, the sheep should be kept on a dry footing, and if on a floor, a little lime sprinkled on it acts as a preventive.

This dreadful disease is said to be more prevalent among Merino sheep than with the long-wooled breeds, owing in part to the difference in the formation of the hoof. Whenever it makes its appearance, it should receive attention at once, as it will be liable to spread through the flock in a short time. Feeding on the same pasture, lying in the same yard, or being driven over the same road with the flocks, or soon after a flock infected with it has passed, will often fasten this disease upon a large portion of the animals thus exposed, as it is very contagious. All sheep showing any sign of it should be at once separated from the well ones, and after an infected flock has been cured, they should not occupy the same grounds for, at least, four or five weeks. In fact, no diseased sheep of any kind should ever be tolerated in a flock, for they are very unprofitable. Inexperienced persons, in buying sheep, should be exceedingly careful, and give special examination before making a purchase, to see that the animals are all perfectly sound. Should there be a single lame one in the flock, especially if the lameness be in the foot, it may be pretty safely depended upon that it has this terrible disease, either in its incipient or more advanced stages.

Hoven.—This difficulty is caused by the vegetable matter in the first stomach becoming fermented, and such a quantity of gas in consequence generated that the sheep swells nearly to bursting, and death sometimes ensues from suffocation. Hoven is quite common when sheep are first turned into a rich pasture; especially clover.

The breathing is short, owing to the distended condition of the stomach, which leaves but little room for respiration, and the body of the sheep is largely distended, especially the left side.

If the fermentation of the contents of the stomach can be checked, relief will soon follow. By driving the sheep gently about for a time will sometimes relieve the difficulty; but a surer remedy is to give a full teaspoonful of spirits of ammonia in a half-pint of water, to be soon followed by a dose of an ounce of epsom salts to relieve the system. This will generally prove effective. Carbonate of soda, such as housekeepers use for cooking purposes, is a good substitute when ammonia cannot be procured; it should be given in doses of two-thirds of a tablespoonful dissolved in a little water, every half-hour until the animal is relieved. A little lime water will sometimes answer the purpose.

As a last resort, when all other remedies fail, it will sometimes be necessary to puncture the side to penetrate the stomach and let out the gas. This is best done with a trocar, an instrument sometimes used by doctors in cases of dropsy. This permits the gas to escape, but prevents the escape of the contents of the stomach into the abdominal cavity, which would produce serious inflammation. This is inserted into the stomach at a point half way between the haunch-bone and the last rib, and near the backbone. This operation is attended with danger, but most animals will recover from it.

When no trocar is to be obtained, a sharp-pointed pocket-knife is sometimes used, and a tube inserted to emit the gas and prevent the escape of the stomach contents. The tube should be removed when the superfluous gas and other matter have ceased to escape.

Liver Rot.—This disease scarcely ever appears in this country, being confined mostly to English sheep. It is generally considered incurable, though not contagious. It has its origin in the liver, and subsequently extends to the lungs, kidneys, and the entire cellular system; the abdomen becomes at length filled with a greenish-colored water or serum, and the disease is sometimes mistaken for the dropsy. The symptoms are dullness, a bluish color of the skin, a little fullness under the jaws, diarrhea, and thirst; thirst, however, being the most noticeable symptom.

This disease, or consumption of the liver, is caused by one of the worst of parasites,—a small fluke-worm, which gets into the liver in a manner similar to trichinæ in pork. It is supposed that this disease results from sheep feeding on low, wet, or marshy lands, such as are subject to an overflow at certain seasons.

It is thought by some writers on this subject that the little insects found in the biliary duct and gall bladder are taken up by the sheep off the grass after the ground dries up, and are passed into the liver through the absorbants or lacteals of the bowels. The mutton is said not to be affected until after the destruction of the liver commences; hence, as there is no known remedy to effect a complete cure, English farmers prepare their animals for the butcher (if not already in condition, which they usually are,) as soon as the first symptoms appear, and thus avoid the loss that would otherwise be sustained.

Maggot fly.—Flies are a great annoyance to sheep in warm weather. They not only deposit their eggs in or near the nostril, causing the disease known as grub in the head, but also among the wool, which, when hatched, the maggot eats into the skin, making sore places, which invite an increase of the difficulty.

The sheep thus affected will become restless and uneasy, rubbing themselves against every obstacle, and will sometimes droop and die, if not relieved of the pests by proper attention. An application of tar, with spirits of turpentine, well mixed together, when applied to the parts affected, and about the ears and tail, will generally remove the difficulty. A mixture of sulphur and lard, with a little spirits of turpentine added, is also a good remedy, when applied to the parts affected.

The backs of long-wooled sheep, by being more exposed, from the open nature of the fleece, are more liable to this difficulty than those breeds having short, thick fleeces.

Wounds of any kind on sheep are liable to the deposit of the eggs of the maggot fly, and should be smeared over with a coating of tar at once to prevent the trouble.

Ophthalmia.—This is an inflammation of the eye, sometimes resulting in a cataract or total blindness. Before resorting to any special treatment, the discharge should be removed from the lids by a small soft sponge and warm water, after which examine the eyelids to ascertain if any foreign substance, such as hay seed or bits of straw, are the cause of the difficulty. If so, carefully remove the foreign substance and bathe the eye-lids with weak salt and water, at the rate of a teaspoonful to half a pint of warm water. Repeat this twice a day until the difficulty is removed. Sometimes a little sulphate of zinc and laudanum added to the water will relieve the difficulty. By placing the animal alone in a dark stable, the eye is in a measure relieved, since a strong light is injurious to the eyes where any degree of inflammation exists.

Poison.—Sheep and lambs are frequently poisoned by eating weeds or shrubs of a poisonous nature, growing in their pastures, the most common of which are both the narrow and broad-leaved laurel or "ivy," as it is called in many sections. St. John's Wort will also poison sheep badly and cause sore lips and face. After eating poisonous herbage sheep will appear dull and stupid, the body will distend a little, and there will generally be a frothy, greenish substance about the mouth; the animal will gulp a greenish fluid, which it will swallow in part, and a part will run out of the mouth and discolor the lips. The usual remedy is to give a good dose of castor oil and milk, in order to free the system of the poison as soon as possible, but this requires considerable time for operation, and permits the poison to be distributed through the system.

Six ounces of sweet-oil, or a half pint of linseed oil, is a good substitute for the castor oil. The use of the stomach pump as soon as the case is detected, and thus dilute the poison with water and extract it immediately from the stomach, is the best course to pursue in such cases. Mr. Morrell advises, in his work on sheep, the use of a gag placed in the mouth, by which means all the greenish fluid, which, in the early stages of poisoning is thrown up from the stomach, can escape from the mouth instead of being swallowed again by the animal. The gag advised is about six inches long, and of the size of the wrist of an ordinary person. It should be placed in the mouth, and a string tied at one end, passed over the head and tied to the other end, in order to hold it in the mouth. The fluid will then run from the mouth as fast as thrown up from the stomach. In addition to this he advises giving roasted onions and sweetened milk freely. Give all the salt that the animal will eat at such times.

When the face and lips are sore from the poison of St. John's Wort, bathe with a solution of salt and water, and afterward apply sulphur and lard, with a little tar well mixed. For sore mouth smear the lips well with tar, and allow the sheep to eat a little of it if they will.

Scab.—This is one of the greatest scourges known to sheep, being very contagious, as well as obstinate, causing a vast amount of annoyance and pain, and if not arrested in time, will result in death. There is also great loss sustained by the destruction of the wool, when this disease becomes well-established in a flock. It is caused by a very small insect, called the acarus (of which there are several varieties), which burrows in the skin and hatches its young there, the new generation coming out only to burrow and extend the hatching territory, and thus the process is repeated *ad infinitum*, until, if unchecked, the entire skin of the animal becomes involved. It is a disease similar to "the itch" in man. The same parasite is also sometimes found in the sebaceous glands of the dog.

SCAB PARASITE.

The constant burrowing of this minute insect causes intense itching and pain, and the poor animal rubs and scratches against every obstacle, bites itself, and pulls out its wool, which only extends the mischief on its own body by making sores on which scabs will form, and soon communicate it to others, until finally an entire flock will be affected with it. After

the forming of the scabs the wool will generally begin to come off in patches, and, if uncured, the animal will lose appetite and pine away and die. The period of incubation or hatching of the eggs of this parasite varies according to surrounding circumstances, it greatly depending upon the temperature and moisture to which they are subjected. Various experiments have been tried to ascertain the length of time required for this purpose, as well as the time that they will retain their vitality and finally hatch under favoring circumstances; but it has not yet been fully demonstrated. An authentic writer says respecting this subject:

"How long such eggs may be preserved without losing their vitality, is a question of supreme importance to the live stock interests, inasmuch as the dangers from infested buildings, clothing, harness, combs, brushes, rubbing posts, and lairs can only be limited by the period of viability of the eggs. Unfortunately this limit has not yet been definitely ascertained, though the analogy with the eggs of worms, and even of the higher animals, would suggest that vitality be retained for months in favorable circumstances. Hence, in a sheep-run full of bushes, stumps, and stones that have been used as rubbing-posts by the scabby flock, the only safety consists in a prolonged absence of the ovine race, and the grazing of such pastures by other animals on which the parasite which has infested this flock is incapable of surviving."

If the skin is examined in the early stages of the disease, it will be found to be covered with yellowish pimples and scurf, after which the scabs form around the roots of the wool and thicken until they finally raise the wool and draw its roots out of the skin. This is why, as the disease advances, bare patches occur on the skin, and the wool hangs in shreds.

In this disease, as well as most others, prevention is easier than the cure, and if animals are well cared for, having a sufficient supply of good hay, roots, and grain in winter, together with an easy access to pure water and salt, with good ventilation, warm, dry beds at night, and are not overcrowded, they will not be liable to contract it in that season; while sweet and abundant pasturage and other favoring conditions will not be liable to engender it in summer. Exposure to the hot sun, as well as exertion to cause perspiration, has a tendency to favor the activity and development of this pest; therefore a sheep pasture should always be supplied with shade to which the sheep can resort when they choose. Healthy, well-fed sheep are less liable to contract the disease than those weak and thin in flesh.

In the first place all the diseased sheep should be separated from the well ones. Before the disease has arrived at the stage where thick scabs have formed, the difficulty can be reached by applying anything that will kill the minute insect that causes the trouble; hence anything that will do this without injury to the sheep will cure the disease. Various remedies are used, but the most common one is the application of a strong decoction of tobacco. From five to six pounds of tobacco, or tobacco stumps, steeped in as many gallons of water until the strength is extracted, and then add enough water to make a bath of from twenty to twenty-five gallons, will usually accomplish the result.

It may be well to repeat this practice in a week or ten days to ensure a thorough cure, and that those insects which may have escaped the first application may receive the second, as tobacco will kill any insect with which it comes in contact. Some wool growers add a pound of blue vitrol to the above to every pound of tobacco; three pounds of either soft or hard soap, and a half pound of flowers of sulphur are also used with the mentioned quantity of tobacco.

When the scabs have become so formed on the surface that they require softening or breaking up in order to reach the little parasites beneath, and which often furnish them a secure shelter from external applications, a dressing of lard well rubbed into the skin is sometimes used, followed with a good wash with strong soap suds, after which the dressing may be applied for the destruction of the insects. It often becomes necessary to shear off some of the wool in order to make thorough work in exterminating them. The sheep should

remain at least three minutes in the bath (which should be warm), that every part of the skin may become wet with this wash, after which the wool should be squeezed to take out the surplus water. They should be dipped according to directions given for dipping for killing ticks.

An arsenic bath is often employed with good effect, but its use is attended with considerable danger, for if the bathed sheep are turned out into a pasture, and a rain storm comes up, the arsenic will be liable to be washed from their fleeces upon the ground, and be afterwards eaten, which may poison large numbers of the flock; besides, sheep will sometimes lick each others' fleeces and may obtain the poison in that manner. If left in a tank where any bird or animal can have access to it, they are liable to drink it, since arsenic is tasteless, and if poured upon the ground it is liable to filter into a well and do injury in this manner, while if burned, it is still more dangerous, as it is condensed from the air on surrounding vegetation, and may act as a slow poison on the animals that may eat it.

Objections might also be urged against mercurial ointments, which are more slow in their effects in poisoning the acari than arsenic, and leave injurious results upon the animals thus treated, by absorption through the skin, among which are mercurial sore mouth, loss of teeth, premature old age, and poor condition generally. It is, however, used quite extensively in many portions of Great Britain. Tobacco, in proper quantity, is the safest, cheapest, and most easy of application of any remedy with which we are familiar, and is equally sure.

Many other remedies which are destructive to the acari, may be injurious to the wool, or exercise a deteriorating effect upon it. This may be said of the alkalies, potassa, soda, and their carbonates, which dry and wither the wool, stunting its growth and rendering it brittle, while tar, carbolic acid, and sulphate of iron, are said by good authority to not only dry the wool and render it brittle, but are liable to impart a permanent stain to it, which would be an injury to the better class of wools.

For dipping pregnant ewes, and very heavy sheep that require considerable care and labor in lifting, an inclined plane leading down into the dipping tank and another leading out of it, will be found a great convenience. The sheep can be held in the tank by the head a few minutes and the liquid washed up on to the head with the hands. Sheep should be dipped, if possible, in dry, pleasant weather, and kept in a yard until their fleeces are dry, and only fed from racks, for if fed from the ground they may be liable to be poisoned from the drippings of their fleeces. When the weather is too cold and severe for dipping, and only a limited number are slightly attacked, the diseased spots on the bodies of the sheep can be carefully searched out and readily detected, and an application of the remedy turned upon these parts of the animal from an old tea pot or dipper, and worked down through the wool to the skin with the hands, which practice will often prove successful in arresting the disease and accomplishing a complete cure.

In more advanced stages of the disease, of course, the more thorough practice of dipping will be necessitated. In all instances where scab has been known, great care must be taken to exclude diseased sheep from well ones, and also from their pastures for several weeks (some writers say three months), and to saturate every rubbing post, tree, stone, or place that could have been used by the diseased sheep for rubbing against, with some of the above-mentioned washes for exterminating the parasites, or with whitewash made of freshly-burned quick lime. The same precaution should be used relative to their yards and the straw from them that had been used for bedding while suffering from the disease. This should be burned up, and new bedding put in its place. It would be well, also, to plow up the yard, and thus throw up the clean, fresh soil. Too great precaution cannot be used to prevent the spreading of this pest. They should by all means be put in a fresh pasture. Cattle and horses can be pastured upon grounds previously grazed by affected sheep without danger, as the insect will not live upon them.

The following method of treatment and manner of constructing a dipping tank for use in exclusive sheep husbandry, is given by Mr. R. R. Wright, Jr., Secretary of the Rocky Mountain Wool Grower's Association, after ten years experience, and may be of interest to others extensively engaged in the wool growing enterprise:

"I take my sheep from the shearing-pen as they are sheared, and examine every one thoroughly; and when I find any signs of scab, I break the skin with a curry-comb until it bleeds. To this spot I apply spirits of tar with a paint brush (full strength), going through every lamb, as well as old sheep. After painting, I let them run ten days, then take them to my dipping apparatus, which consists of a tank, 35 feet long, 5 feet deep, and 18 inches wide. I dig a hole in the ground, brick it up, and cement the tank on the inside, with a large dripping pen, divided so that one pen will be dripping while I am filling the other. I have large tanks to soak and steep my tobacco in, which is done with a small-sized steam boiler, and have pipes running from my tank to the dipping vat; and in that way I can keep the dip the temperature I want it, which is about 120° (no hotter).

The dip that I have had the best success with (and I have used almost every dip known), is as follows: 30 lbs. leaf tobacco, 8 lbs. sulphur, 1 lb. arsenic, and one quart spirits of tar, to every 100 gallons of water. I add the sulphur, arsenic, and spirits of tar to the tobacco mixture in the dipping vat. I let my tobacco soak for twelve hours (the longer the better), then boil it for two hours, keeping my tank covered, to keep the steam from escaping. My sheep that were painted with the spirits of tar, ten days before, are put in a large corral, to which is attached a small pen that will hold, say 200 sheep. These sheep are caught and thrown into the vat, head first, and made to swim the whole length of the tank, and come out in the dripping pens.

When they come to a sheep that has been painted, these spots are painted again, and any sheep that has it bad is held in the vat about a minute before it is allowed to swim through. As soon as the sheep are dipped they are taken to a new range, or to a portion of the old range where they have not been for some time, and put in clean corrals; they are held there twelve days, brought back, dipped the second time, and taken to another part of the range. Usually two dippings like the above, with the painting, will cure any ordinary case of scab; but if they are very bad it will take three. Every sheep must be examined and well dipped, for if you slight one that has the scab, you will never cure it.

The sheep ought not to be put back in the old corrals or old range for two months, and not then unless the corrals have been thoroughly cleansed and whitewashed, or there have been heavy rains or snow. With my arrangements, I can dip 3,000 head per day. It has been two years since I have had any scab in my herds; but it cost me over $3,300 before I would believe they could not be cured while I used the same corrals and range while doctoring them."

Thorough treatment and prompt attention cannot be too strongly urged in this disease, for the safety and welfare of the flock.

Sore Eyes. (See Ophthalmia.)

Sore Lips. — Sometimes the lips of sheep become so sore and swollen as to render eating not only a very painful process, but almost impossible. Wash the parts affected with warm soap suds, and apply freely over the surface an ointment made of the following compound: Five ounces of glycerine, one drachm of camphor, one drachm of alcohol, one ounce of flowers of sulphur, and one-half ounce of creosote. This may require several applications, but is a sure remedy; apply twice a day. An ointment made of tar, a little sulphur, and unsalted butter or lard, is also a good remedy. It should be applied about twice a day, for several days.

Ticks and Lice. — Ticks and lice are a great nuisance, and not only cause a great deal of suffering to the poor animals, but keep the sheep in thin flesh and deteriorate the fleece. They will also sometimes cause sheep to pull their wool. No flock infested with them will flourish either as mutton or wool producers. Neglected sheep will be very apt to have these parasites, and often those having the best of care; therefore it is well for the farmer to guard against the evil, as they can be easily destroyed.

SHEEP TICK AND EGG.

After the sheep are sheared the ticks leave them and get in the longer wool of the lambs, where they will feed on their more tender flesh. They will usually have all left the sheep by the third week after shearing; the lambs should then be dipped in a decoction of tobacco or other wash to exterminate these pests. For this purpose a deep, narrow box or tank is the best construction for the wash. The usual allowance of tobacco is six or seven pounds of plug tobacco for one hundred sheep or lambs. It should be chopped into fine pieces and boiled until the strength is extracted. If too strong it will have a tendency to sicken or kill the lambs.

Another wash sometimes used for the eradication of these parasites is a solution of arsenic and water, made by dissolving three pounds of white arsenic (powder) in boiling water, and adding forty gallons of cold water. Great care must be used not to inhale the vapor from the boiling water and arsenic, as it is a deadly poison, and the person who dips the sheep must have his hands free from eruptions, bruises, or cuts, or he might be poisoned by the process. After dipping the lambs, the wash must be put where no animal can have access to it.

In dipping, one man should hold the animal by the fore legs with one hand, and with the other clasp the nose and mouth to prevent the liquid from entering; another man holds it by the hind legs and they dip it in this position, after which the animal is placed in an empty tub and the water squeezed from the wool, which can be saved as it accumulates, to add to the wash. Care should also be used to prevent the wash getting into the animal's eyes. The animal should not be allowed to remain long in the wash as injurious results would follow, but simply immersed and taken out as soon as the wool is saturated, which will require but a moment. Pregnant ewes should always be handled with care.

Worms.—There are many kinds of worms that sometimes affect sheep and lambs, causing great suffering and even death. The intestines of a sheep are very long, being twenty-eight times the length of its own body, while those of the human species is only about the length of the body; this extraordinary length in the sheep allows room for a large number of diseases, and when death is caused by worms, an examination of the stomach and bowels will often reveal myriads of them. It is supposed that the germs of the worms are admitted to the stomach with the food, the eggs being swallowed with the grass. The germ of the tape-worm is thought to be voided by most animals, especially the dog. The symptoms of the tape-worm are variable, sometimes that of a voracious appetite, and again evincing a disinclination to touch food, loss of flesh, and an unnatural appetite for ashes, mortar, sand, earth, etc.

The evacuations lose their natural form and become soft, giving the sheep a filthy appearance like diarrhea. An ounce of turpentine mixed with milk and given in the morning before the animal has eaten anything, keeping food from it for an hour following, to be repeated each alternate day for ten days, is often practiced with good effect, after which a good dose of castor or linseed oil should be given to free the system. Good, nutritious food should be given during the time of treatment.

Other remedies recommended are as follows: two-thirds of an ounce of turpentine, with two ounces of linseed oil, mixed in a strong decoction or tea made of worm seed, (*Chenopodium anthelminticum*) commonly known as "Jerusalem Oak," given twice a week for

ANGORA GOATS.
Bred by Col. Robert W. Scott, Frankfort, Ky.

two or three weeks. This is said to be a sure cure, and the sheep will usually get well and begin to fatten in about three weeks. Bruising a quantity of pumpkin seeds, and giving a strong tea made from them for several days, is said to be a safe and effective cure. Having never tried this remedy, we cannot recommend it from experience. Hair worms are also very common and troublesome in sheep, and are frequently found in the stomach and intestines of sheep and lambs that have died from persistent diarrhea, and are a species of tricocephalus. When afflicted with them the animal will have diarrhea and become rapidly emaciated; the worms are also often seen about the vent.

Salt and sulphate of iron in half-ounce doses, given each alternate day for a few days, is a remedy often resorted to. Care should be taken not to give too large a dose as the sulphate of iron is very astringent and might do harm if improperly administered. The above remedies for tape-worm are also recommended for the hair or pin-worm.

These parasites are the cause of much irritation and injury to the stomach and intestines. They burrow their heads into the lining membrane of each and suck the juice from them, upon which they subsist. The remedy, to be effective, must be such as will destroy the worms without injury to these delicate membranes of the sheep. Turpentine is thought by some to be injurious to the kidneys, but it is more frequently used for this difficulty than any other remedy. It is highly important to give nutritious food in order to support the strength of the animal, as the effect of the worms is very debilitating. The doses above recommended are suitable for a full grown sheep. Lambs should of course take a proportionate quantity.

Another common parasite very troublesome, is the *Strangylus filaria*, which is a thread-worm that infests the air passages of both the throat and lungs of the sheep, and is usually present in flocks that have access to ponds and streams, and that pasture on wet, swampy lands. This worm is a species related to that which is troublesome to fowls, causing gapes in chickens, and is frequently fatal to lambs. Turpentine is the effectual remedy, and should be given according to the above directions. Well water is best for sheep, being free from the eggs of parasites.

THE ANGORA GOAT.

THE successful rearing of the Angora goat in this country, has thus far been limited to a few individuals, the numerous failures in this enterprise being attributed to incompetent management, unnatural location, climate, and food, and by permitting the herds to deteriorate by not maintaining a high standard in breeding. The pure-bred Angora goat is in many respects the most valuable lanigerous animal known, and we believe the time is not far distant, when the value of the industry which it represents will be more fully understood and appreciated in this country, and those localities suited to its successful development will be appropriated to this enterprise, which will materially add to the nation's wealth and prosperity.

The Angora goat is often improperly confounded with the Cashmere species, although it is very different, the two varieties being almost as distinct as a goat and a sheep, and should never be classed as the same. The principal feature of the Angora is the length and quality of its hair, which has a very soft and silky texture, is strong, fine, and lustrous, and for various uses is unexcelled in strength, durability, and cheapness. This hair covers the entire body, and a great portion of the legs, with a compact, lustrous, wavy fleece, the animal in its best condition producing ten to twelve pounds of the mohair, at a single shearing, although the average is generally less than ten pounds. The horns of the male are quite long, nearly vertical, and somewhat spiral in form, while those of the female have a horizontal tendency resembling those of a ram. The face resembles somewhat that of the sheep.

The coat is composed of two kinds of hair, the one short and coarse which lies close to the skin, the other long and curly, and partaking of the nature of wool, forming the outer covering of the fleece. Both are used for manufacturing purposes, but the exterior portion, which makes by far the greater bulk, is the more valuable part of the fleece.

The Cashmere goat has a delicate head, with long, wide, semi-pendulous ears. The horns are erect, slightly spiral, and inclining inward to the extent that they sometimes cross. Like the Angora, the coat is composed of two materials, but it is the under coat of this breed, or that next the skin, that is the most valued in commerce. This under growth is of a grayish-white tinge, is soft, silky, and of a fluffy nature similar to down; the quantity produced by a good specimen of the breed will weigh from six ounces to a pound, the average amount being less than half a pound. This under growth of the Cashmere makes its appearance in autumn, and continues to grow until the following spring, when, if it is not removed from the fleece by being combed out, it falls off naturally, like the feathers of a moulting bird. It is used in the manufacture of the celebrated cashmere shawls. The difference between these two breeds of goats is thus very readily seen. The habitat of the Angora goat is a mountainous region, high and dry, with free range for exercise and browsing the shrubs and coarse herbage upon which it subsists. While the goat will be healthy, and produce a fine fleece in some other localities, it will not be as white and fine as in the cooler and dryer regions. Nevada, New Mexico, Montana, and some portions of California, as well as many other sections of the west, will prove a desirable climate for the Angora goat husbandry, while the Appalachian or Alleghany ranges, from the central portion of Virginia to Alabama, are also admirably adapted to it. Says a recent writer on this subject:—

"The industry in Asia Minor is dwindling away, from oppression, taxation, unusual losses by stress of weather and short feed, and the general inefficiency that marks the decaying Ottoman Empire. It is being successfully transplanted to the English Colonies, notably those of Australia and South Africa. The value of the product has been, at the latter point, increased from $1,625, in 1866, to $650,000 the past year. In the United States the industry has had a precarious existence for thirty years. While in that time the merino industry has culminated, after a previous length of tutelage, in its present magnificent proportions, that of mohair has given very insignificant results, for the time, labor, and expense involved. The reasons are very plain to him who will look at the matter in an unprejudiced way. The Angora goat will not, like the sheep in its various breeds, thrive in most all localities and conditions. Therefore, the attempt to plant the industry amid the rich clover-fields of Belmont, in Massachusetts, the vast undulations of Texas, the slopes and adjacent islands of the California coast, etc., has, in most cases, proved a failure. There is no reason whatever to doubt that when the order of nature, as to the home, habits, and food of the animal are observed, the Angora will thrive in the United States as well as in Asia Minor."

The illustration represents specimens of the Angora goat from the herds of Col. Robert W. Scott, who has been an extensive breeder of these animals for more than twenty years. The likeness in front is of a pure-bred buck, that on the left of a pure-bred ewe, and that on the right of a full-blood ewe, made by crossing the common goat (five or more times) with the pure Angora bucks.

Importations of the Angora Goat into the United States.—The first importation of this goat to the United States was made by Dr. Jas. B. Davis, of South Carolina. This gentlemen was, during President Polk's administration, sent to Turkey by the request of the Sultan of that country, to experiment in the culture of cotton in the Sultan's dominions; on his return to America, in 1848, the Sultan ordered a selection of nine of the finest specimens of fleece-bearing goats in his dominions, and presented them to Dr. Davis, to experiment with in this country. Since that time various other importations have been made. Col. C. W. Jenks, of Boston, has recently imported for Hon. Richard Peters, of Atlanta, Georgia, several fine specimens of the Geredeh Angora breed from Asia Minor, to add to his flock of

several hundred of these animals on his ranche in Georgia. This gentleman has been engaged in the Angora goat husbandry for about thirty years, and has not only found it a pleasant but profitable enterprise. So valuable were the animals considered that were imported by Dr. Davis, that he readily sold their offspring at from one to three thousand dollars per pair.

Habits and General Management of Angora Goats.—With respect to the treatment of this subject, we shall depend largely upon information furnished us at our request by Col. Robert W. Scott, of Frankfort, Kentucky, who from his experience of more than twenty years in goat husbandry is fully qualified to impart valuable knowledge and suggestions relative to it. He says :—

"In size they are superior to the native or common goat. Wethers, when fully grown and fatted, will weigh from sixty to eighty pounds, live weight. A wether of my flock, two years old, has weighed, when dressed, fifty-four and a half pounds, net—the fore-quarters, eighteen pounds; the hind-quarters, twenty-one pounds; the saddle, twelve pounds; and the rendered tallow, three and a half pounds; the tallow much more in some other cases. The color of pure-bred and full-blood animals is almost invariably white, though some of the earliest descendants of imported animals were brown; some being gray and some black, also, in their native country, varying a little, perhaps, in species or family of species. Their gay and intelligent appearance, their cleanly habits, active and playful disposition, make them attractive on a farm; while in their nature they are so docile that they may be raised so as to be as familiar about the house and yard as the dog or the cat. Though they have great curiosity and enterprise, they also have strong local attachments, and after wandering all day will generally seek their usual shelter at night, especially if the weather be inclement. They do not break fences, or clear them at a single bound, as most other stock do, but will pass through a hole which is already made, will climb up a rail which leans at about forty-five degrees, or will bound on top of, and then over, a low fence. Any good farm fence five feet high, except stone fence, will keep them securely. Like other stock, they are more troublesome after they have acquired roaming and breachy habits. They bear coupling, hobbling, and tethering better than any other stock. In their diet they are almost omnivorous, eating in winter often what they have rejected in summer. On large farms much the greater portion of their diet will consist of weeds, bushes, briers, fallen leaves, brush, etc., and they are truly valuable for keeping lands clean of these. In winter, short grass and corn-fodder is all that is required, even by the breeding flock, and I have never found it necessary to feed grain of any kind to them at any season. A dry shelter is desirable for them, especially to the females in kidding season; though my flocks of males and wethers, even after they have been shorn in April, have never had any protection other than what they could obtain around a hay or straw-stack.

"In breeding they are precocious, the females capable of breeding at seven months, and the males of propagation still earlier. As the females carry their young only five months, it is possible for them to have young within twelve months old; but I do not think it advisable that either sex breed in less than twelve or eighteen months old. Generally the *pure-bred* animals have but one at a birth; while grade and full-blooded females will have from one to five, and with reasonable care will often raise as many kids as there are mothers in the flock, and often more. If the weather be pleasant, and the kids, at their birth, can once get dry, and stand up and suck, they require but little attention afterwards. The mothers may sometimes lose or leave them in large pastures, especially if they have more than one, when they are very young. Like deer, they incline to leave their young, and return and suckle them at intervals, during the first few days after birth. A protracted cold rain is often fatal to a kid at the time of its birth; it is therefore desirable to house the females at night during the period of parturition. The males should be bred to the females, so that the kids will come in pleasant weather, and as simultaneous as possible, for which, and other reasons it is

preferable, commonly, to keep the adult males and wethers separate from the breeding flock. The bucks are said to be valuable in protecting the flock from the attacks of dogs, and under my observation the goats are most commonly the attacking party, having seen them frequently charge and drive away a loafing dog. They do not, by flight, invite the pursuit of dogs, as sheep do; and dogs do not seem to have the same disposition to worry or to eat them, which they manifest towards sheep. The goats will often bite, hook, and butt each other, yet they are never cross with other stock, and the males do not fight and injure each other as male sheep often do.

Hon. Richard Peters of Georgia, says: "The Angoras in this climate shed their 'over-coat' of mohair in March or April of each year, if it is not sooner sheared. They continue in their summer suit of short hair or kemp until July, when the mohair starts out, growing slowly until September, then rapidly until January, when it gets its full growth, averaging in length about nine inches. I have owned Angoras from six distinct importations from Asia. I have found them to differ greatly in size, fleece, horns, and the shape of their ears. For over twenty years I have observed the following rules in selecting a stock buck: 1st. Weight and length of the white ringleted fleece, its freedom from coarse hair or mane along the back and on the neck and thighs; 2d. Size and stamina; 3d. Long pendant ears; 4th. Spiral upright horns. By this system of selection I have obtained a flock possessing great uniformity.

In making other importations, the agent should remain in Angora (the central district of Asia Minor) at least one year, so as to be able to make his selections when the goats are in full fleece; by this plan some fine specimens might possibly be obtained. Several of the importations were doubtless procured near the coast, they evidently being of mixed blood, and in no respect superior to American grade Angoras, called at the west 'full bloods'; such as are of a higher grade than a fourth cross, or 31-32 Angora and 1-32 common short haired native goat. The fleece of the pure-breed Angora males is coarser than that of the females, and becomes shorter in both from year to year after the fifth year."

Care of Kids.—If the bucks are allowed to run with the flocks, there will be two crops of kids per year, one coming in the fall or winter, which will require considerable care. It is better therefore, to so manage, if they produce but once annually, that the kids shall come in the spring, after all danger from cold winds and rains has passed.

The period of gestation is from a hundred and forty-five to a hundred and fifty days. Until young kids have suckled they are very sensitive to cold, but having once had their nourishment, their vitality seems wonderfully increased, and is greater than that of almost any other domestic animal. When about three weeks old, castration should be performed on all males not designed for breeding purposes. The kids are easily managed at this period, and the wound rapidly heals. The treatment should be similar to that of castrating lambs.

Food of Goats.—Goats will pick up a subsistence where almost any other animal would starve. They like best to browse among the rocks on briars and bushes, and will soon clear a pasture of them, which is a cheap and easy method of clearing such lands. They will never feed on clover or grasses as long as they can have access to such coarser herbage; in fact, if highly fed on clover and the cultivated grasses, they will not thrive.

Grades, etc.—It is better to maintain the flock pure, although by breeding a thorough-bred buck to the common goats of the country, a fine grade can be produced in five or six years that, to all appearance, are nearly equal to the pure bloods; but these grade bucks should never be used to perpetuate the herds, for if they are, disappointment will be the result. Only pure bred bucks should ever be used, as the grade bucks will deteriorate the flock, however good specimens of the breed they may appear to be. It is to this mistake of using grade bucks that the greater part of the failures of the Angora goat culture in this country is due.

There are some breeders who have crossed pure bred animals upon the common goats of the country, and have in some instances sold grade animals as though they possessed all the excellence of the pure bred goat, and the purchasers breeding them to the common goat as such, have experienced the failure that would naturally result, and, becoming disgusted with the business, have let the breeds run entirely out. In the hands of intelligent and honest breeders, with suitable surroundings, including wide range and a high and dry habitat, there is no reason why goat husbandry in this country may not prove eminently successful and profitable.

Goats Used to Protect Sheep.—Farmers in some sections of the country use goats to protect the sheep from dogs. For a flock of from fifty to seventy-five sheep, two goats is the usual number for this purpose, and they are said to be amply able to protect them from such intruders, their butting propensities being too much for the canine, who soon finds himself rolling over and over. A few repetitions of such treatment causes the dog to leave the field in a limping condition, somewhat downcast in appearance. When the sheep have no such protection, and a dog enters the field at night, the sheep will run wildly about, bleating piteously, but when goats are used to guard them, they form in a compact body, behind the goats, and seem to be fearless, and to rather enjoy the fun. This practice of utilizing goats originated in the West, where they were put in sheep pens to protect from wolves.

Products of the Angora Goat.—The most important product of the Angora goat is the mohair, which its fleece supplies. It is not a mere substitute for wool, but occupies its own place among the textile materials. It preserves the lustre and appearance of silk, without its suppleness, and differs from wool in its lack of felting qualities, the fabrics made from it having always distinct and separate fibres, being distinguished particularly for their lustre, durability, and elasticity. It is particularly adapted to the manufacture of Utrecht velvets, commonly termed "furniture plush," the finest qualities of which materials are composed principally of mohair. This plush is very durable, owing to its elasticity, the fibre springing back immediately to its upright position when a pressure against it is removed. The mohair plush is therefore in general use in the construction of railroad cars, being the most indestructible of all materials for upholstering the seats. It is also used in a similar manner in manufacturing the imitation of seal skins, the highest qualities of which are often very striking in their resemblance to real seal fur.

Mohair is also used for making the best carriage and lap robes, having a long and lustrous pile, some imitations of the skins of tigers and leopards being very beautiful. It is indispensable in the manufacture of braids for binding, possessing the lustre of silk with a superior durability.

Still another important use of this material is in furnishing fine and beautiful fabrics for dress goods, which resemble alpaca, and are called mohair lustres or brilliantines. In France it is used in the manufacture of laces, which are substituted for the silk laces of Valenciennes and Chantilly. The English have attained the greatest success in spinning mohair, the French and German manufacturers depending almost exclusively upon English yarns of this material, with the exception of that spun at Bonbaix in France. Owing to the stiffness of the mohair, it is rarely woven alone; hence, when used for filling, the warp is usually of cotton, silk, or wool; or if used for warp, the filling is usually one of these materials. The flesh of the Angora goat is highly nutritious, as well as very healthful and easy of digestion; and if well fattened with corn, is thought by many to be superior to the best Southdown mutton. The milk is also very nutritious and is often prescribed by physicians for invalids and infants. The skins of the young kids are valuable, when taken off after the hair is of proper length, and bring a high price in the market, as well as those of the

older animals. Their hides are manufactured into morocco leather. When we come to consider the ease with which these animals are reared, and the slight expense involved in the food consumed by them, there is scarcely any animal that returns so much in products for the capital invested.

Shearing Goats and Preparing Mohair for Market.—As with the shearing of sheep, considerable care is necessary to have the wool in a fine condition for market; the same is true respecting the preparation of mohair for sale and the manufacturers' use. Col. Robert Scott gives directions for shearing and packing the mohair, as follows:

"About the 1st of April, in Kentucky, when a somewhat fuzzy appearance in the fleece denotes that some of the goats begin to shed their wool, they should be well washed without the use of soap, in clear water (and the warmest accessible, though not artificially heated), and on a clear and sunny day. The males especially require washing. It may often be dispensed with after a heavy rain, and especially with the females and wethers. For this purpose, place a hog-scalding box, or other box or trough, near a clear pond or stream, and fill with water; submerge the goat to the neck in it, two men holding and rubbing. When the wool is cleaned of any dirt, and of the old skin which is being shed off, stand the goat upon a plank placed across the box, and press the wool with the hands, and let the water drain for a few minutes.

After drying thoroughly for a week or two in a clean pasture, they may be shorn like sheep, if practicable, cutting off the wool about the ends of the hair, which is then growing out among the wool of grade goats. It is desirable to get as little as possible of the old skin and of the growing hair in the shorn fleece of wool. Each fleece should be carefully rolled up separately, outside out, and tied up securely and closely with small, fine, colored thread or twine. Pack the fleeces closely in a bag which will contain one hundred and fifty or two hundred pounds, and it is ready for market. The female goats should be handled with great care, as, in this climate, they are then heavy with young."

Diseases and Parasites of the Angora Goat.—This species of goat, as well as most others, is extremely hardy, as will be seen by the following statements from two of the oldest breeders of goats in the country.

Colonel Robert Scott says: "Though I have been breeding these animals twenty years, and once had over two hundred head of them of all ages, yet there has never been any epidemic disease among them. During this time I have lost several by worms in the nose, as with sheep, and one by a swelling of the glands of the throat. A humor in the cleft of the hoof, like scratches in horses, has given me more trouble than all other diseases. It is caused by wading through high, wet grass, yields readily to strong acids, and never kills. Wash the sore repeatedly in carbolic soap suds, or in turpentine, and then apply a salve made of bluestone, copperas, or tar. A variety of small, long, red vermin is peculiar to them; is not fatal, and can be destroyed mainly by preparations of tobacco, cresylic soap, or camphor, sulphur, etc., applied along the back."

Mr. Peters of Georgia also states that: "The Angoras may be classed with the herbivorous animals. They have not proved to be a success in the Eastern and Middle States, when kept in small enclosures on grass, during the summer, and in winter in close barns, and fed on grain and hay. At my farm, near Atlanta, they have succeeded admirably, being exempt from disease and able to protect themselves from attacks by dogs; but they are allowed to run out, summer and winter, in an inclosure of over a hundred acres of woods-pasture land, which they have greatly improved by killing the undergrowth of briars and bushes."

It will be seen by the preceding statements, that goats may be easily reared in a climate adapted to them, that they have few diseases, and under proper management the industry may be made a remunerative one.

GROUP OF ALPACAS.

ALPACAS.

THE Alpaca is a native of the lofty table-lands and mountain range of the Andes in Peru and Chili, and has long occupied in that region of the globe, the position held by its congeners of larger size—the camel—in the old world. Llamas were to the ancient Peruvians the only available beasts of burden and wool-bearing sources, the same as the camel is at the present day to the tribes of the Asiatic deserts. The camel (*Camelus*) and llama (*Auchenia*), form the two existing genera of the family *Camelidae*, and they thus, in a zoölogical sense, represent each other in different regions of the earth. A great deal of doubt and confusion, however, has existed as to the number of species into which the llama can be divided.

Most authorities now agree in regarding them separable into four species, viz.: the llama (*Auchenialama*), the huanaco or guanaco (*A. huanaco*), the Alpaca or paco (*A. paco*), and the vicugna (*A. vicunna*). The llama and guanaco were formerly more valued as beasts of burden, and their flesh, than wool, being able to bear daily from 120 to 150 pounds burden over long distances.

Description, etc.—The guanaco attains about the size of the red deer, and is the largest, as well as most widely disseminated of all the species, being found from the equator to Patagonia. The llama is next in size, and is mostly limited in its habitat, to the loftier mountains of Northern Peru. The Alpaca is considerably smaller than either the above-mentioned species, but in general outline all the species have a strong resemblance. In its native condition, the Alpaca ranges between 10° and 20° south latitude, from the center of Peru into Bolivia, not often coming lower down than between 8,000 and 9,000 feet above the sea-level. At and above these heights, it lives in herds in a semi-domesticated state. being only driven into the villages to be shorn.

The wool is of very fine quality, lustrous, and in color mostly white, black, or gray; the shades of brown or fawn are sometimes seen, but are more rare.

The illustration of Alpacas is from a photograph of a group of these animals from the flock of Hon. Francis Thomas, formerly minister to Peru. They were imported by him, and placed on his farm in Frankville, Alleghany County, Maryland. Mr. Thomas, in writing to a friend respecting them, says:

"The fibre of a fleece of twelve months' growth often exceeds fifteen inches in length, and the fleeces average from seven pounds to ten pounds each in weight. The animals live to the age of twenty, twenty-five, and sometimes thirty years; are too large and bold to be worried by dogs, and very docile and tractable. I think you will concur with me in the opinion that this experiment which I am conducting is well worth the expense which I have incurred, especially when we consider the public benefit which would accrue in case of my success."

Domestication, Value of Wool, etc.—There is evidence of these animals having been domesticated and used for their wool, from remote antiquity, as remains of clothing made from the Alpaca wool have been found in the graves of the Incas; and when, in the early part of the sixteenth century, Peru was first visited by Europeans, these animals formed the chief wealth of the natives, being carriers of commerce, as well as the main source of their food and clothing. The wool first became an article of commerce in England in 1829, and in 1836 it became an established trading commodity with Europe. In that year Sir Titus Salt, a manufacturer in Bradford, purchased a quantity of Alpaca wool and tried various experiments to discover its value and capabilities. His great success led to the establishment of extensive manufactories, and making Alpaca a staple second in importance to wool. England now imports annually above 3,000,000 pounds of this wool.

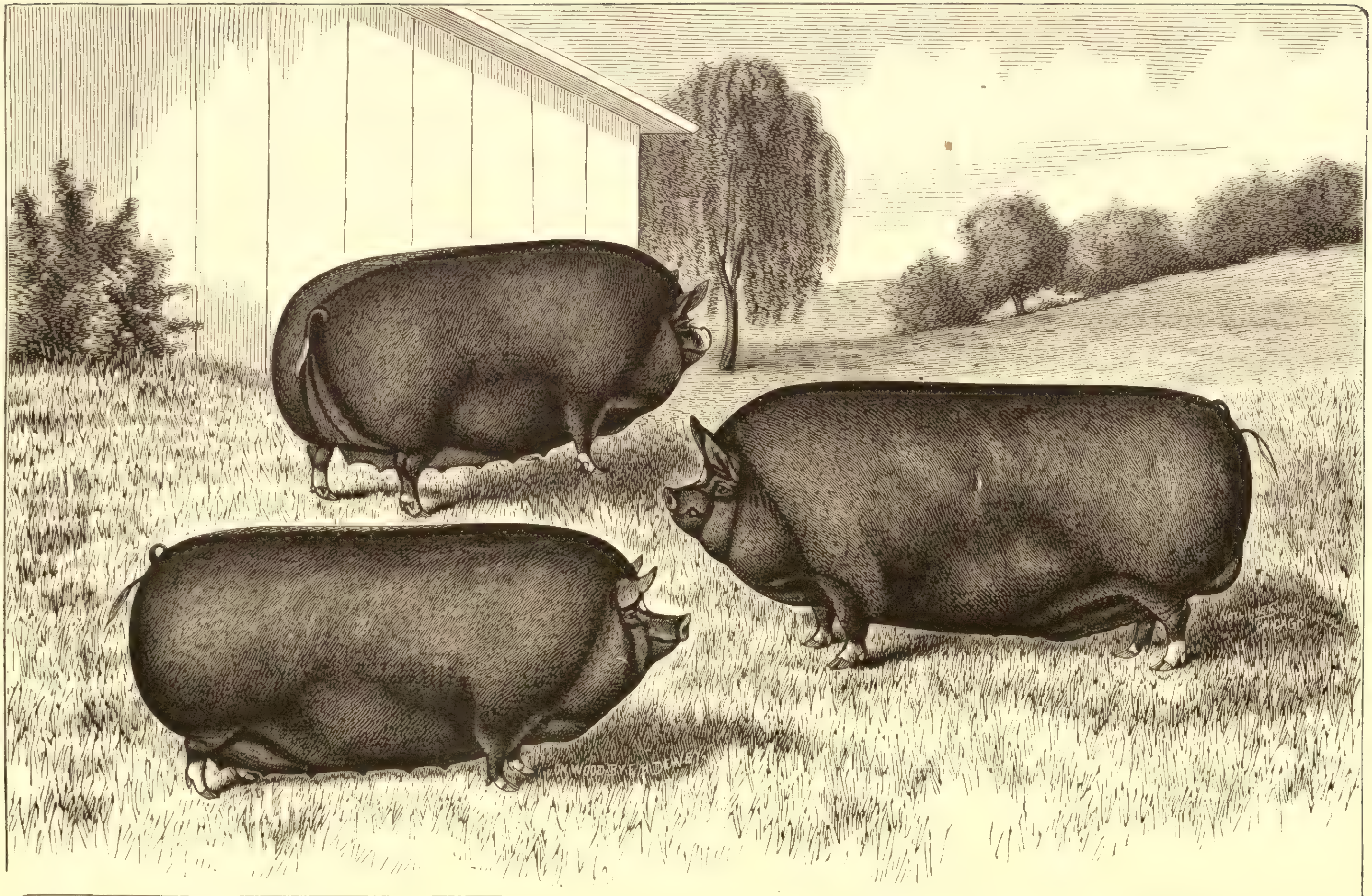
Many systematic and costly attempts have been made to introduce the Alpaca to Australia. The experiments at first gave promise of success, but gradually they failed to become acclimatized, and weakened by the loss of their native mountain-climate, they finally drooped, and so many died that the prospect of success seemed anything but encouraging. Notwithstanding various failures to introduce this valuable animal into other than its native climate, we see no reason why it should not prove a decided success, providing we follow the law of their nature, and place them in localities and conditions as nearly allied as possible to their own native mountain-habitat. A noted agricultural authority speaks of their introduction into this country, as follows:

"Attempts have been made at various times in this country, in Europe, and in Australia to introduce the alpaca, but generally without profitable result. Various causes have contributed to the failure of these efforts. Sometimes the confinement on shipboard during a long voyage, with impure air and unaccustomed food, has nearly destroyed the stock. Again, the animals, when brought to their destined abode, have been placed on luxuriant clover pasture, or other food, so much richer than the coarse herbage of their native regions that disease has fastened on the whole flock.

The alpaca is indigenous in the mountain regions of Peru, and thrives in the highest inhabited districts of the Andes, where the cold is more severe than in most parts of the United States. Accustomed to the vicissitudes of such regions, and inured to cold, damp, hunger, and thirst, it is especially adapted to bleak hill districts. Yet it is said to do well in most localities where the air is pure, the heat not oppressive, and water for bathing readily accessible. The latter is stated to be indispensable to the health of the animal, which, when deprived of this requisite, soon becomes fevered and infected with scab.

While the introduction of the alpaca into this country still remains a matter of experiment, there is no known reason why such experiments should not be successful, when properly conducted, in localities affording some approximation of the native conditions of the animal. Not to mention many elevated situations in the Atlantic, Northern, and Central States, the regions lying along the Rocky Mountain ranges have been indicated as presenting good opportunities for such trials."

It therefore still remains to be seen whether the rearing of these animals in the United States shall prove a success, and thus open a new field of enterprise and wealth hitherto unknown in the agriculture of this country.



BERKSHIRES, "LADY HOOD II," "BLACK JOSEPHINE," "ROBIN HOOD."
Property of Alex. M. Fulford, Bel Air, Md.

SWINE.

THE present domestic breeds of swine are the remote offspring of the wild swine (*Sus scrofa*), and though occupying a less prominent place in the estimation of the farmer generally than the horse, ox, or sheep, the hog is nevertheless an animal of great value, being easily reared, arriving quickly at maturity, subsisting on a great variety of food, and yielding a larger and quicker return in the amount of flesh in proportion to live weight and food consumed, than any other domestic animal whose flesh is used for food.

This animal is found in almost every zone, although his natural habitat, as with most of the thick-skinned animals, is in warm climates. The original country of the hog, however, is unknown, as is the case with many of the domestic animals. It has been known to exist in a wild state in Asia, Europe, and Africa, ever since history began. A species of wild hog is also found in America. Swine are very abundant in China, the East Indies, and those groups of islands found in the Southern and Pacific Oceans; they are also extensively raised in Europe, and especially in the United States, where pork is one of the most valuable exports, swine being raised in many States and Territories in the Union, and always at a fair profit when properly managed.

Swine are reared for meat alone, the sole aim of the breeder being to produce an animal that will render the largest amount of pork and lard, from a given amount of food. While swine are kept to a greater or less extent by all American farmers, the great swine-breeding regions of the country are northwest of the Alleghanies. Of the nearly forty millions of hogs in the United States, it is estimated that three-fifths of that number are raised in the following Mississippi Valley States, viz.: Illinois, Iowa, Missouri, Indiana, Ohio, Kentucky, Tennessee, Kansas, Nebraska, and Wisconsin; while these States produce annually about three-fourths of the entire corn crop of the country.

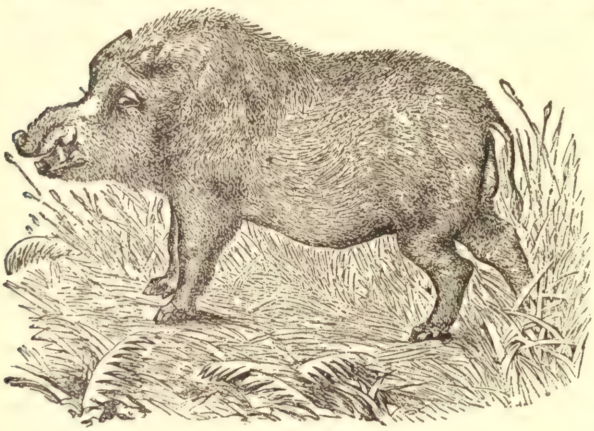
With a large home consumption, some of our recent exports of pork and its products have amounted to nearly a hundred millions of dollars annually. From the fact that swine are easily kept and fattened, they afford an easy and profitable means of converting the bulky and low-priced farm products of the Great West into a portable and salable commodity, the pork-packing establishments of Chicago and Cincinnati being the largest in the world.

It is interesting as well as amusing to compare the facts concerning swine and other farm stock gleaned from the scant literature of 150 to 200 years ago with that of the present time, and to note the progress that has been made during that period.

John Laurance, M.A., rector of an English parish, edited a work upon "Agriculture and Gardening," which was published in the year 1726, in which he speaks of the hog as a useful animal in that he furnishes good substantial meat for human consumption, but refers to him as a beast hard to restrain, as he is given to tearing down fences, and going wherever he likes. He mentions white as the prevailing color, but states that, of late, "a black hog has been introduced, smaller in size than the common hog of the country, and having a big belly."

Another work published in London about that time, edited by James Lambert, and entitled "The Countryman's Treasure," in describing the desirable qualities of the boar, says: "His bristles should be rough and strong, erecting themselves on every occasion of anger and disgust." The same work also recommends,—"that in order to keep fattening hogs free from the measles, put finely sifted red lead or red ochre in the swill. Also dead flesh should be kept away from them, and neither should they be permitted to drink fish water, nor the washings of any mustard plates or trenchers, nor any soap water, for that will sicken them and breed diseases in their eyes and head. Nail thin plates of lead in the bottom of their troughs, which will cool their noses, and make them feed with more delight, and by a secret quality hinder inflammation of their lungs. Let their styes be in such places where the extremes of heat and cold may not affect them, though they rather covet cold than heat, being themselves of a hot constitution."

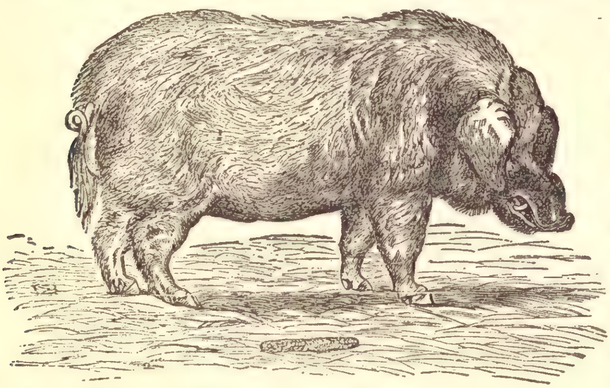
Origin of the Present Breeds of Swine.—It is asserted by eminent authority that all the known breeds of swine may be divided into two classes or groups, viz.: one having the characteristics of and doubtless descending from the common wild boar; the other differing in several important respects from the latter and of wild, unknown parentage. By crossing and other conditions favorable to the improvement of the race, for several generations, these distinctive characteristics have gradually become largely changed. It is well known that where swine run at large, often going far in search of food, they will in a few generations adapt themselves to this kind of life, and become good travelers, having long legs suited to the purpose; and if in addition to this they are obliged to root for a portion of their food, their snouts will become proportionately long and powerful. On the other hand, when hogs are well housed and fed, being well cared for in all respects for a long period, they also become changed for the better; the skin and hair becomes finer, the legs shorter and finer, with a more symmetrical body, smaller head, ears, and snout; and while as workers for a living they grow slowly and are long in reaching maturity, under the latter favorable conditions, they grow rapidly and mature early; all of which shows that these animals, as well as those of some of the higher order, readily adapt themselves to circumstances. The following is a very correct representation of the wild boar, the pig progenitor of the porkers of to-day, but when compared with our improved breeds the relationship could scarcely be recognized. He is described as having a large tusk, a long snout, and a much larger head in proportion to the size of the body than our domestic pig; also with smaller ears, pointed and upright, and at maturity usually black. He does not attain his full growth until he is five or six years old, and has been known to live twenty or thirty years. The sow breeds but once a year, and seldom has more than five or six at a litter. She suckles them for three or four months, and allows them to follow her two or three years, or until they are strong enough to defend themselves, so that she would often be followed by three litters of different ages at one time. The original or native breeds of Great Britain seem to be two; the old English hog, and a breed found in the Highlands and islands of Scotland. The former is described as tall, gaunt, a very long body with a thick covering of bristles, pendent ears, and long snout The latter breed were small, of a dusky brown color, with coarse bristles along the spine, and prick ears. They were exceedingly hardy, subsisting upon the poorest fare, and often left to range about without shelter and take care of themselves as best they could. The improved races, now brought to such a high degree of excellence, were obtained by crossing these native breeds with foreign hogs, the Chinese and Neapolitan being the principal ones for this purpose. The modern *white* breeds with fine bone, thin skin, short limbs, prick ears, and remarkable propensity to fatten at an early age, take these qualities from the Chinese stock; while to the Neapolitan is attributed the characteristics which distinguish the improved *black* breeds, of which the Essex is a fine type.



WILD BOAR.

The latter class are characterized by very fine bone, black color, soft skin nearly destitute of hair, very small muzzle, and early maturity. It will be seen, by comparing the following illustration of the Old English hog with the former, that a great improvement has here been made upon the wild boar to attain to even that standard; and that further improvement could be made by simply good care and judicious selection. As it is, it will weigh more in

proportion to size than the wild hog, and is withal a better animal in all the pig points. The descendants of this old breed are now seen principally in the western counties of England, where hogs of immense size are still reared, but greatly improved, when compared with their ancestry, all of the points of the improved English hog being much finer, the carcass thicker, and the propensity to fatten greatly increased. This breed is exceedingly prolific, the sows, which are excellent nurses, often having from twelve to eighteen pigs in one litter. It is supposed that the Berkshire and Hampshire came originally from this stock, but by some early cross obtained their present characteristics. It is found, however, that sows of the Neapolitan breed and its crosses are better mothers and nurses than the Chinese; both kinds also requiring peculiar care to prevent the breeding sows from becoming hurtfully fat; so much so that unless kept on rather scanty fare they become useless for breeding.



THE OLD ENGLISH HOG.

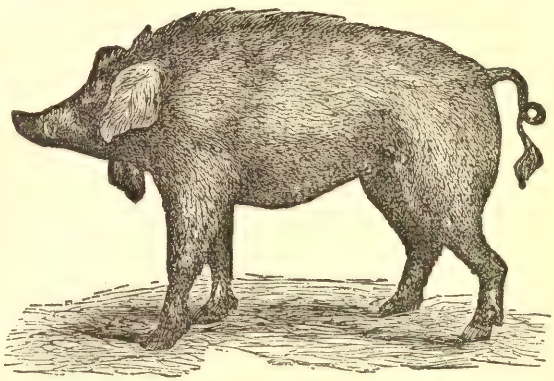
Darwin, in his observations upon the variations of swine under domestication, has the following, touching the tendency of domesticated animals to revert to their feral or wild type:

"The common belief that all domesticated animals, when they run wild, revert completely to the character of their parent stock, is chiefly founded, as far as I can discover, on feral pigs. But even in this case the belief is not grounded on sufficient evidence; for the two main types of *S. scrofa* and *Indicus* have never been distinguished in a feral state. The young re-acquire their longitudinal stripes, and the boars invariably re-assume their tusks. They revert also in the general shape of their bodies, and in the length of their legs and muzzles, to the state of the wild animal, as might have been expected from the amount of exercise which they are compelled to take in search of food. In Jamaica the feral pigs do not acquire the full size of the European wild boar, 'never attaining a greater height than twenty inches at the shoulder.' In various countries they re-assume their original bristly covering, but in different degrees, dependent on the climate; thus, according to Roulin, the semi-feral pigs in the hot valleys of New Granada are very scantily clothed, whereas on the Paramos, at the height of from 7000 to 8000 feet, they acquire a thick covering of wool lying under the bristles, like that on the truly wild pigs of France. These pigs on the Paramos are small and stunted. The wild boar of India is said to have the bristles at the end of its tail arranged like the plumes of an arrow, whilst the European boar has a simple tuft; and it is a curious fact that many, but not all, of the feral pigs in Jamaica, derived from a Spanish stock, have a plumed tail. With respect to color, feral pigs generally revert to that of the wild boar; but in certain parts of South America, as we have seen, some of the semi-feral pigs have a curious white band across their stomachs; and in certain other hot places the pigs are red, and this color has likewise occasionally been observed in the feral pigs of Jamaica. From these several facts we see that with pigs, when feral, there is a strong tendency to revert to the wild type; but that this tendency is largely governed by the nature of the climate, amount of exercise, and other causes of change to which they have been subjected.

"The last point worth notice is, that we have unusually good evidence of breeds of pigs now keeping perfectly true which have been formed by the crossing of several distinct breeds. The Improved Essex pigs, for instance, breed very true; but there is no doubt that they largely owe their present excellent qualities to crosses originally made by Lord Western

with the Neapolitan race, and to subsequent crosses with the Berkshire breed (this also having been improved by Neapolitan crosses), and likewise, probably, with the Sussex breed. In breeds thus formed by complex crosses, the most careful and unremitting selection during many generations has been found to be indispensable. Chiefly in consequence of so much crossing, some well-known breeds have undergone rapid changes, thus, according to Nathusius, the Berkshire breed of 1780 is quite different from that of 1810; and since this latter period at least two distinct forms have borne the same name."

These wild hogs sometimes grow very large, but usually are less in size than our domestic swine. The engraving, of the old Irish Greyhound pig, exhibits an intermediate animal, a kind of connecting link between the wild and domestic hog. Richardson, from whose work the illustration is taken, describes this breed as follows:—



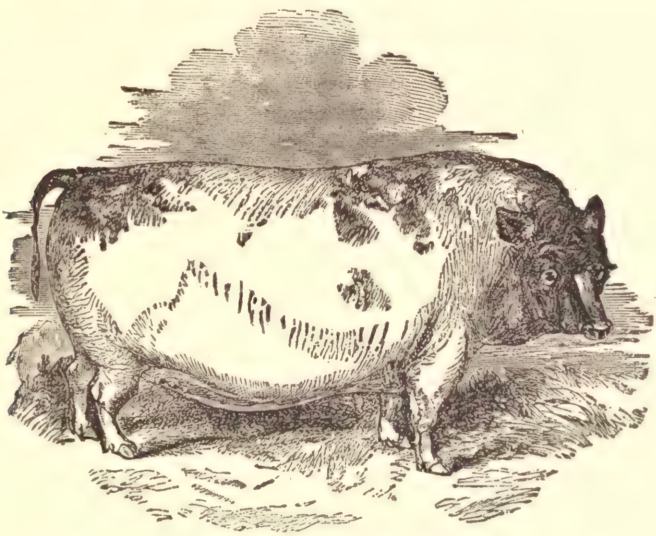
OLD IRISH PIG.

"They are tall, long-legged, bony, heavy-eared, coarse-haired animals, their throats furnished pendulous wattles, and by no means possessing half so much the appearance of domestic swine as they do of the wild boar, the great original of the race. In Ireland, the old gaunt race of hogs has, for many years past, been gradually wearing away, and is now, perhaps, wholly confined to the western parts of the country, especially Galway. These swine are remarkably active, and will clear a five-barred gate as well as any hunter; on this account they should, if it is desirable to keep them, be kept in well-fenced inclosures."

The Chinese Hog, previously mentioned as an important and potent element in the animal make-up of the Improved English Swine, is in shape very peculiar; the body being long, legs short, back long and swaying somewhat toward the center, the belly nearly touching the ground; jowls very heavy; ears small, and standing out from the head, but not drooping; head and snout short, and very wide between the eyes; neck short; color white or black, or a mixture of both, with the white predominating. The effect of the Chinese cross has been to completely transform the long-legged, elephantine-eared, coarsed-boned, gigantic hog of Old England into the heavy-jowled, short-legged, compact, early maturing, Berkshire, Essex, Poland, China, Small Yorkshire, and Suffolk of the present day. The prepotency of the Chinese blood is seen at every hand in all the improved breeds, there being a tendency to revert to the original Chinese type. Judging from the well known authenticity of the Chinese civilization, it is fair to presume that its breed of swine antedates in its origin that of any other race of domestic animals now known to Europe or America. The facility with which the Chinese pig fattens is one of its distinguishing characteristics; it being stated that from the time it is a week old till it is slaughtered at maturity, it is fat; that when kept in the same pen with others of our best varieties of pigs, the feed being hardly sufficient to sustain life in them, the Chinese pig is fat; when butchered, no matter at what age, the Chinese pig is a mass of fat. The flesh of this hog is not prized either in Europe or America, because of the superabundance of fat; but the effects of crossing this animal upon the old English breeds have been as remarkable as they have been satisfactory. The illustration given is the best obtainable representation of this justly celebrated animal, and shows him to be true to our description, and also a very peculiar specimen of the swine family.

In the foregoing facts briefly stated, have been indicated in a measure the original sources of our improved breeds of swine, and the physical changes which have been wrought in this animal by the treatment it has received in the hands of intelligent breeders. It will also be seen that the greatest improvements in our domestic breeds of swine have resulted by crossing with the hog of China and Italy. The hog of India has also aided much in this improvement. The Chinese imparted a remarkable aptitude to fatten, while the Neapolitan, and hogs of India, that of excellence of flesh and improved form.

An able writer has said that "the breed goes in at the mouth." With other conditions, such as shelter, watchful, sanitary care, and proper selection for breeding being included, we heartily endorse the statement; for with a distinct object in view, the breeder can arrange to have the pig travel slowly or quickly to the pork barrel, as may be desired; this being accomplished by allowing only such animals to breed as are suited to the purpose aimed at.



IMPORTED CHINESE SOW.

No one, however, should expect a high success as a breeder of any stock without proper management and care, including regular and liberal feeding, for without interest sufficient to induce him to give personal supervision and generous treatment to his animals, he has no reason to be disappointed if the result be meager and unsatisfactory generally. It has been found that a few months even, of neglect and starvation, will, in the majority of cases, counteract nearly all the advantages which the breed has acquired by generations of careful breeding and proper management.

Neapolitan Swine.—This breed of swine is noted for the excellent quality of its flesh, fine form, small bones, thin skin, slight quantity of hair, and aptitude to fatten readily. To this breed and the Chinese is due much of the improvement of all the English breeds, particularly the Berkshire, Essex, Yorkshire, and Hampshire. The first importations of these hogs into the United States was about 1840; they are described as having been of a dark slate color.

Neapolitans have a small head in proportion to the size of the body; face dishing; forehead bony and flat; snout rather long and very slender; ears small, thin, and standing forward nearly horizontally; jowls very full; neck short, broad, and heavy above; body long, cylindrical, and well ribbed back; the ribs arching; back flat; hind quarters slightly higher than the fore; legs small, with small joints; hams and shoulders well developed and containing a

large proportional amount of lean meat; color slate or of a bluish plum; skin soft and fine, and nearly destitute of hair.

These swine mature early, and their flesh is very tender and delicate flavored. A leading writer says of it, "they make the most delicate of all pork, which tastes more like the flesh of a fat, tender young chicken, than pork." The well known agricultural writer, Mr. A. B. Allen, says of them:

"Notwithstanding they are so highly prized by amateurs, for the delicacy of their flesh, these swine have not found much favor among Northern farmers, except by the way of a stolen cross now and then. The reason of this is, I presume, in consequence of their almost entire want of hair rendering them less hardy in enduring the winter than thicker haired animals; and the pigs, also, till they reach three or four months of age, being more tender. I do not know of any one in New York or its vicinity who is keeping up the pure breed. Those I imported, not being at that time in a position for breeding, I made presents to my friends, who inform me that they have suffered them to run out, finding the Berkshire more profitable to keep on their farms. My brother, the late Mr. Richard L. Allen, when traveling in Italy, in the spring of 1869, wrote me as follows:

'I have never seen finer pigs than are generally to be found around Naples. They are invariably black (by this it must be understood that they varied from this to a dark slate or plum color), with very fine legs, muzzle, and tail, and scarcely any hair; and what there is of it fine, and indicating speedy fattening qualities. The nose is generally too long, but I have seen models which the white Prince Alberts or Suffolks could not beat. These animals are coarser and less refined as we advance north, and in Rome are not so good, though they still retain many of their excellent fattening qualities. I have repeatedly seen them of the same type, wholly or mostly black, near the summit of the Alps, in Switzerland, where they are kept during the summer months, to consume the offal of the goats and cows.

How these creatures subsist here during winter, I do not quite understand. I saw myriads of them in Perugia (Italy) — it seemed to be a market day — going into town and out of it, and into the railroad cars, lean, long-eared, frequently marked much like Berkshires, with white on the face and feet, and many with a broad white stripe entirely around the fore part of the body. Those I saw in the fields were also very thin, and seemed occupied with grubbing, and always under the direction of an attendant; and I presume here they found all their sustenance till the pastures again produced clover, and the goats and cows milk. The pig seemed an important institution in the social arrangements of many of the peasants, as with the Irish, though in another fashion. One served as a shepherd dog, his master patting him as he ran up for orders; when he would start off on a gallop, to head off the sheep that were going in a wrong direction, again returning for an approving caress, and a new mission elsewhere.'

I have thought best to give the above extract entire, so that the reader may know the difference between the pure, high-bred swine of Naples, and those which are undoubtedly grades, in other parts of Italy and Switzerland, showing that, as such, they were hardy, thrifty, and docile.

In addition to the amusing anecdote I give from my brother's letter of a pig performing the duties of a shepherd dog, in another letter, which I cannot now lay my hand on, or somewhere else, I have read of one acting as a pointer to a sportsman shooting quails and partridges. This shows the Neapolitans as uncommonly tractable, and easily instructed, and commends them as excellent pupils for circus performance."

The Hog of India.—This animal is regarded as the ancestor of the Neapolitan, and as one of the means of improvement in our present breeds of swine. It resembles the latter in many respects, although differing essentially in others. This animal has a small head, dished face, thin jowls, slender, erect ears; small, short legs, being fine in all its parts;

hams and shoulders heavy, body compact, and well ribbed; color varying from a jet black to a slate, or deep plum; skin thin and elastic, but firm. The form is symmetrical, while the quality of the flesh is excellent. These characteristics have been transmitted largely to our present breeds in crossing with others.

Improved Breeds of Swine.—Fifteen or twenty years ago, but little attention was paid by the farmers of this country generally to the improvement of swine, except to breed from the best of the common stock; but at the present time we see that a great change has taken place in this respect, there being comparatively but few hogs raised that are not of the improved breeds, or their crosses; hence we now have the desirable qualities of compact form with the least amount of offal or waste; early maturity, readiness to fatten on a smaller amount of food, together with a better quality of meat. When we compare the present improved breeds of swine,—the Berkshire, Poland, China, and Essex, for instance, with their ancestors, the wild boar, old English, or old Irish, or Irish greyhound hog (as the latter is sometimes called), we shall then be able to realize what the breeder has accomplished, and some of the difficulties that have been met and overcome.

The breeds formerly raised were mostly white, but a large proportion of them now bred are black, or nearly so, the most numerous of these being the Berkshires, Poland Chinas, and Essex. The improved breeds of to-day are the Berkshire and Essex of the black varieties; the Poland China and the Jersey Red and Duroc, that are of mixed colors, black and white, the latter being a yellowish red with black spots, while of the white breeds we have the Yorkshire, the oldest and originally the largest of the English varieties of swine, a strain from which have come several types or breeds, through the efforts of English breeders, such as the Improved Large Yorkshire, the Middle breed, the Small Yorkshire, and the Suffolk. Then we have the Chester Whites and Cheshire, or Jefferson County hogs, that belong to the popular white breeds, these being distinctly American, as are also the Poland China, the Jersey Reds and Durocs. Of these, the Poland Chinas and Chester Whites have perhaps been bred in the largest numbers.

The principal English breeds are the Berkshire, Essex, Suffolk, Yorkshire, Dorset, Lancashire, etc., the first four mentioned being the most widely disseminated of breeds from this source. The above-mentioned breeds supply mainly the porcine products for the pork markets of the civilized world.

BERKSHIRES.

THE Berkshire is one of the oldest English breeds, it having maintained a high reputation for centuries; in fact, it seems to have taken the place among swine that the thoroughbred has among horses,—type of the highest style of breeding. These hogs are noted for compact form, fine bone, large muscles, and for furnishing excellent hams and shoulders. They produce more lean meat of excellent quality, well distributed, than many other breeds, and consequently a less proportionate amount of lard and other fat.

A good American authority says, "It has been generally said of the Berkshires that they were more likely to bring a large number of pigs at a litter than any other breed of swine. This, as a rule, has probably been the case in times past. What was true in this respect was also true as to their ability to rear their pigs, for they were good nurses, having abundance of milk. But from the laws, conditions, and habits which govern the breeding and nursing capacities of domestic animals in general, the hog is not by any means exempt.

When the Berkshire brood sow, through breeding for fancy and fat—the effort in these directions having been pushed to extremes—parts with her proverbial fecundity, taking her position alongside of other high-bred swine, this must be regarded in the same way as are the results of any other radical change in organization.

The fair-sized medium fatteners are the breeders for stocking the farm with pigs; and as the highest model for profit must be the same in every kind or breed of farm stock bred for its flesh, it follows that the different breeds of swine, as they take on this model, must, in obedience to inflexible laws, approach a common standard in the matter of increase. If the Berkshires were, as the evidences for a good many years seemed to show, superior to other breeds in bringing large litters, no one need be surprised if, in the hands of certain American and English breeders, they drop down in numbers as they change in refinement and tendency to obesity."

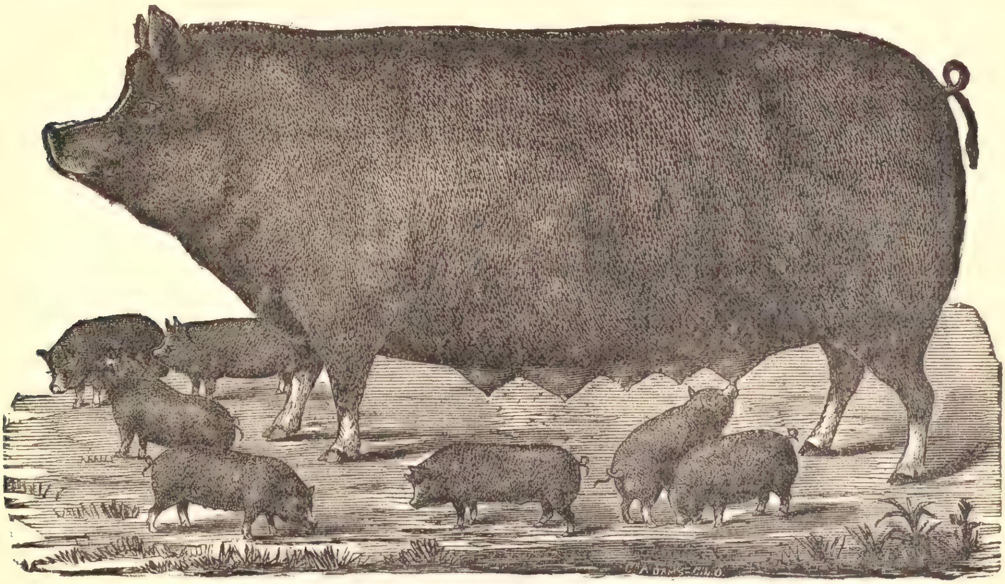
Description.—The Berkshire is characterized by a uniform black color, with white marking in the dish of the face, on the feet, and the brush of the tail. Sometimes a white spot or two appears on the other parts of the body, but such are generally discarded for breeding purposes, as the above color and markings are considered most desirable. They breed with great uniformity, although there are occasional indications seen of a reversion of the original color, by the appearance of reddish brown or bluish spots.

The improved Berkshires of the present day are a remarkably well defined breed, possessing in an eminent degree many valuable qualities. They may be described as follows: Face short, broad, and well dished; forehead broad, eyes rather large and bright; snout short, ears of medium size, thin, and soft, and carried rather upright; jowls full; neck rather short and thick; shoulders broad at the top, and deep through the chest; back broad; ribs long and well sprung, giving rotundity to body; hams thick, round, and deep, thickness extending well down on the back, causing the legs to stand well apart; legs short and fine, but straight and strong, with hoofs erect, tail tapering and rather fine; size medium; bones fine and compact; hair rather fine and soft; color of body black, with smooth, plum-colored skin; feet and tip of the tail white, with usually a dash of white in the face, and not unfrequently a white nose.

The large, heavy-boned Berkshire has been greatly modified, having lost its coarseness

and grown more shapely by the change, and these are desirable improvements; and when we add that the *average Berkshire* of to-day weighs at six months 160 lbs., at nine months 236 lbs., at twelve months 322 lbs., at eighteen months 413 lbs., and at twenty-four months 495 lbs., some reaching 600 lbs., it will be seen that we still have a good sized animal in the improved Berkshire. This is generally known to be the most active and muscular of all our breeds of swine; and while this has sometimes been offered as an objection, yet it is a quality that makes them especially desirable to follow cattle, a method of feeding much practiced by farmers in the great corn-growing regions; and when we consider that the hardiness and endurance resulting from greater freedom and much exercise is, doubtless, one of the principal reasons why this breed is less liable to the prevailing swine diseases than others are, we see that the objection is more than met.

The Berkshires are noted for their docility and prolificacy, the sows uniformly making good mothers as well as producing large litters. The young are strong and healthy, and soon able to take care of themselves, are generally of uniform size and appearance, grow rapidly to maturity, and can be marketed at an early age; thus enabling the breeder to make quick returns—a most desirable thing to do in these days when men travel by express, talk by telephone, write by telegraph, and print by steam.



IMPORTED BERKSHIRE SOW, "GRAND DUCHESS."
Property of W. L. Mallow, Concord Farm, New Holland, Ohio.

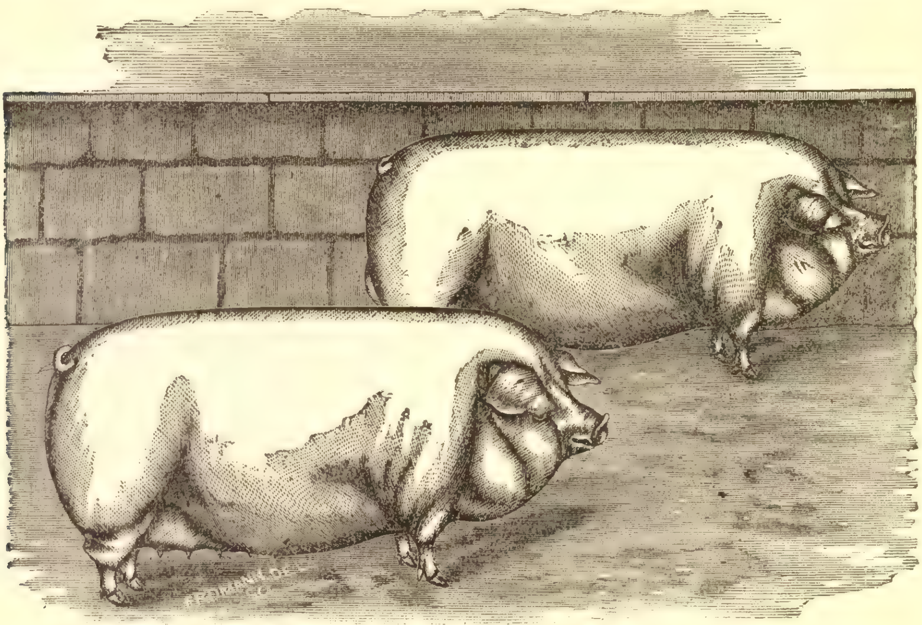
This animal is much used in crossing other swine stocks, with a view to improving it, there being a certainty of good results from such use. Besides, the Berkshire is a good grazer, thriving with the help of a little grain, and growing fat on good pasturing during the summer months; in brief, the Berkshire is among other breeds of swine, as distinguished a representative of the hog family, as is the noted short horn among cattle.

Our illustrations are faithful representations taken from photographs of the animals. The above was bred by Russell Swanwick, Cirencester, England, and is a good type of the breed.

CHESTER WHITES.

THIS breed derives its name from its having originated in Chester County, Pa. The history of its origin is as follows: In the year 1818 a fine pair of pigs were brought into this country from Bedfordshire, England, by Capt. James Jeffries, and sent to his farm near the county seat. Some of the more enterprising farmers of the neighborhood appreciating the desirable qualities of these animals, were encouraged to commence improving their swine, which they did by crossing the descendants of this pair upon the best formed and most desirable native stock that could be obtained; and thus by a course of careful and judicious crossing and selection for a number of years, the present valuable breed of systematically formed, good sized, and easily fattened hogs were produced, commonly known as Chester Whites.

This breed of swine has been very popular and much prized on account of their large size and the ease with which they fatten. They will readily weigh 200 to 225 pounds at from five to six months old, and from 400 to 700 pounds at twelve or fourteen months, while it is not unusual for an old hog, when well fatted, to attain the weight of 1,000 pounds.

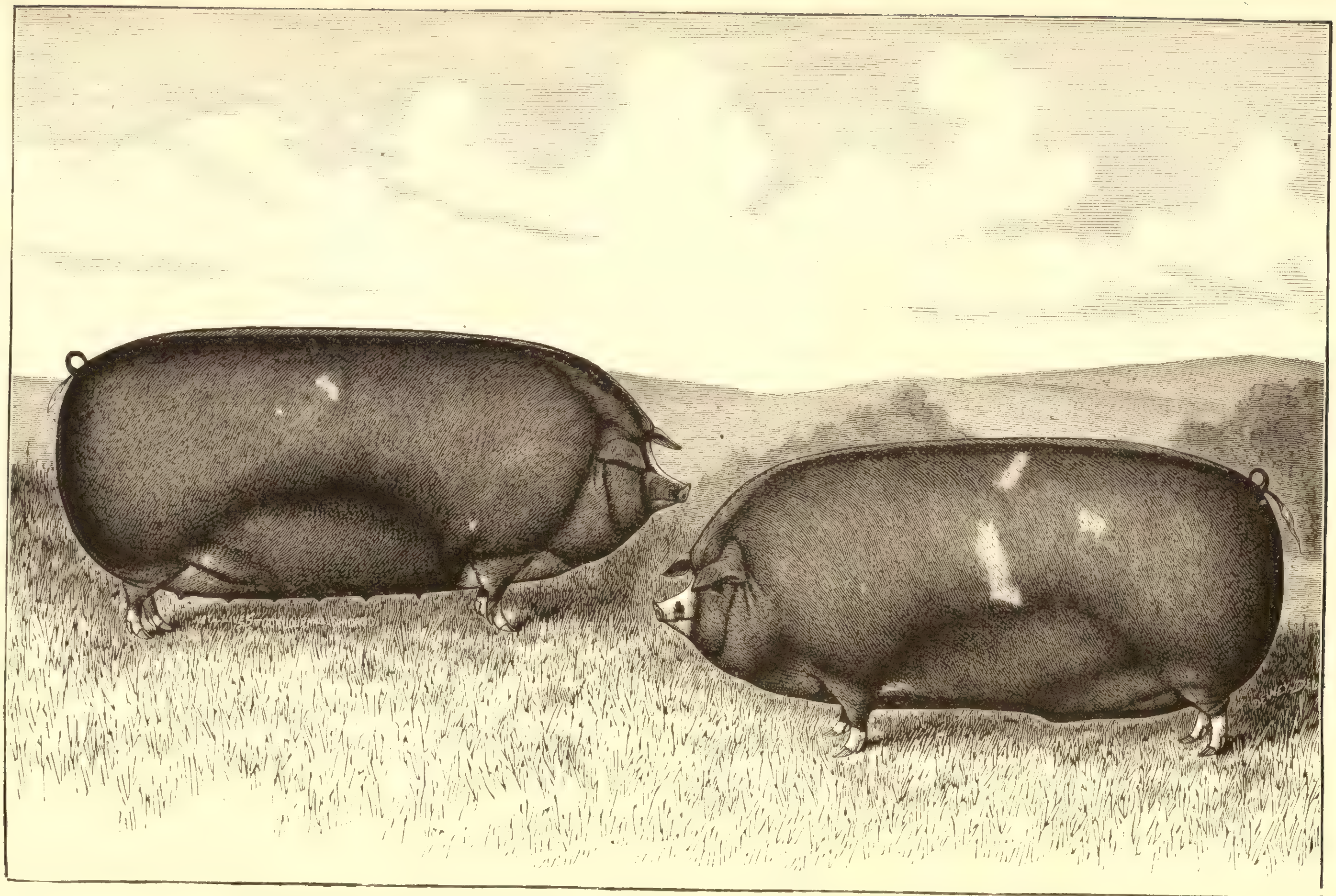


CHESTER WHITES, BRED BY BENSON, MAULE & CO., PHILADELPHIA, PA.

They are gentle, quiet, easily kept, and may be fattened for the market at almost any age.

Description.—This breed may be described as follows: A short head; broad between the eyes; slightly dished face; medium sized ears projecting forward and dropping at the tips; body long and particularly deep; back broad and straight; hair heavy, generally wavy, and snow white; skin soft, white, and thin.

The Chester Whites are a prolific breed, and make excellent mothers. In breeding, it is always best to permit the animals to attain a good size, in order to keep up the large size and prevent the prominent characteristics of the breed from deteriorating. These hogs always give good results when either kept pure or crossed on other breeds.



POLAND-CHINA HOGS, "JENNIE LIND" and "CHIEFTAIN."

Winners of *Stock Journal Challenge Pitcher* at Fat Stock Show, Chicago, 1879 and 1880. Property of J. A. Countryman, Rochelle, Ill.

POLAND CHINAS.

THE Poland China breed seems to divide the honors with the Berkshires at all the fairs in the great corn-growing States; it being in many cases the most numerously represented of all the breeds. There has been much controversy concerning the origin of this breed of swine, which is variously known as the Poland China, Magie, Warren County, Butler County, and by some the Miami County breed. In discussing this point, a high American authority says:

"It unquestionably originated in the Miami Valley of Southern Ohio, and was the result of crossing several distinct breeds, and of long-continued selection with a view to producing great fattening qualities and early maturity, as well as great size; and while there is still a considerable lack of uniformity, it has clearly become an established breed. The color is black, with irregular white spots, the black largely prédominating; and some of them with white markings, almost identical with those of the modern Berkshire—a circumstance which sometimes leads to a suspicion of a recent Berkshire cross. But this suspicion is by no means warranted by the facts, as some of the purest-bred specimens we have ever known were so marked.

As a breed, they are larger than the Berkshire, more quiet and sluggish in their movements, heavier in the jowl and flank, and do not stand up so firmly upon their feet. In some cases the ears are rather large and pendulous, but in the herds of a majority of good breeders of to-day, the ears, while always drooping, will be found quite small and thin. The head and snout is shaped much like those of the best-bred Berkshires, although there is perhaps more of the "dish-face" tendency in the latter than in the former. This is the popular breed among general farmers all over the West, and its advocates claim that its quiet and contented disposition make it the best breed in the world for converting corn into pork and lard."

The National Swine Breeder's Convention, after a full and free discussion of the subject, decided upon the present name, Poland China, by which this breed is commonly known and accepted throughout the country, it having several years since become an established breed. It is claimed by some that for more than thirty years no new blood has been introduced into this breed, and that no effort has been made to obtain a new supply of the blood of breeds from which it originated, while at the same time efforts have been made towards its improvement by careful selection in breeding.

The swine are strong and hardy, fatten well, and at ten or twelve months will sometimes dress 350 pounds. They will weigh from 450 to 700 pounds when from eighteen to twenty months old, under proper management, hogs having been raised that weighed at maturity 900 pounds or more.

Description.—The Poland Chinas have long, deep bodies, broad, straight backs; large, square hams and shoulders; short heads, wide between the eyes, drooping ears; thick necks and large jowls; short, well set legs; hair fine. In color they are spotted or dark; the black with small white spots scattered more or less over the body are considered the most desirable. They are naturally very docile, and make excellent mothers. In fact, they seem to combine the good qualities of both large and small breeds.

CHESHIRES.

THE Cheshire is purely an American breed, and is regarded by many as only a modified Yorkshire. It originated in Jefferson County, New York, and is known also in some localities by the name of the Jefferson County breed. These hogs are excellent for fattening exclusively in the pen. The flesh is fine grained, while the carcass has a small amount of offal in proportion to the amount of pork it affords. A western breeder of experience states that for seven years he had these hogs without introducing any new blood but what was supposed to be pure, and that he produced all the different types of the Yorkshire, from the large to the Lancashire Shortface.

The white color was firmly fixed, and he never knew a Cheshire boar to get a pig that had a black hair on it, although they were bred to sows of all breeds, including the purest Essex. Another peculiarity he watched with interest was the frequent appearance of blue spots in the skin of the purest and best bred specimens. This peculiarity sometimes disappeared for one or two generations, and would again crop out even stronger than ever. The type which he finally succeeded in establishing upon the Cheshires, as bred by him, was the identical size, form, and quality of the approved medium Berkshire. Indeed, so marked was this resemblance in all things but color, that they were often called white Berkshires.

A new interest is being taken in this breed in some sections at present, they being bred more extensively than formerly.

Description. — These hogs are pure white in color, with thin skin, and usually thin hair, showing a pink color through the hair. The snout is usually rather long, but slender and fine; the jowls plump, ears erect, fine, and thin; the shoulders wide, the hams full, and the body long and deep. As compared with the Chester Whites, they are nearly as large, with finer bones.

ESSEX.

THIS is one of the oldest English breeds of swine. The first improvement on the Essex was made by Lord Western, who devoted much of his time to the cultivation of live stock. While traveling in Italy, he saw for the first time, and greatly admired the Neapolitan breed of swine, there found in its greatest purity in the peninsula between the bay of Naples and Salerno. He purchased a pair of the best specimens from which he bred in-and-in until there was danger of the breed becoming extinct. He then used the Essex and, as some suppose, the Berkshire and Sussex sows, in crossing with the Neapolitan, the results of which he gives as follows :

"I have so completely engrafted this stock upon British breeds, that I think my herd can scarcely be distinguished from the pure blood of Neapolitans."

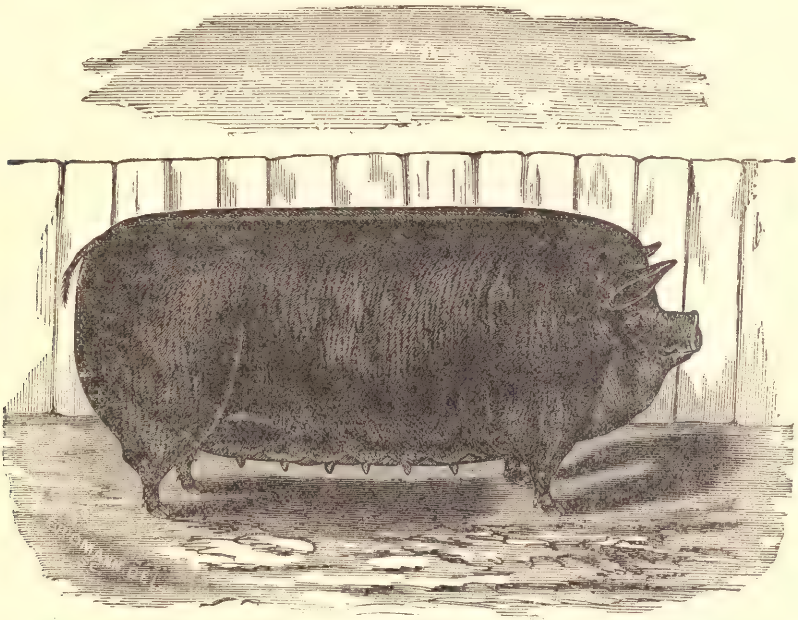
These pigs had great success at agricultural fairs, but as Lord Western bred exclusively from his own animals, his stock soon began to degenerate in size, muscle, constitution, and fecundity; and while the result of his careful experiments in breeding was a benefit to the surrounding country by the Essex cross, his own particular herd degenerated greatly. At this period, the best of the male animals from Lord Western's stock were bred by others to strong and vigorous Essex sows, carefully selected, and from this source originated the famous Improved Essex breed.

These swine are very popular in England, as well as in this country, being everywhere regarded as a valuable breed, whether maintained in its purity, or used in crossing upon inferior swine.

Description. — Color pure black, any white or spots of other color being inadmissible; they have a short dished face, broad between the eyes, ears small, soft, and standing nearly erect while young, but coming down somewhat as they get older; jowls full; neck short and thick; shoulders short from the neck, but deep from back down; back broad and straight. The body should be of medium length, broad, deep, and straight, with heavy hams; bones fine, but sufficiently strong to support the body; skin pliable; hair fine and soft, and not very heavy; no bristles; legs short and fine, but straight and set wide apart; hoofs erect; size medium.

When matured, the improved Essex will weigh from 300 to 400 pounds. They mature early, are prolific, and possess great vigor of constitution. The pork is of fine quality and flavor, having a good proportion of lean meat. They are good graziers, doing well where there is a plenty of grass and pure water, and will endure a hot climate better than many breeds. Mr. Joseph Harris, author of a work on swine, says of them:

"No hog cholera or similar disease has ever affected my herd. I have now over three hundred hogs, and I attribute their health and freedom from all disease in great part to the fact that the herd is summered on grass.



ESSEX SOW, "BLACK PRINCESS."

The Essex are so *quiet*, so refined, so docile, that they will keep fat on grass, I can rarely afford my hogs the luxury of a clover pasture. Those farmers who have plenty of clover, could not do a more profitable thing than to keep plenty of Essex swine. In sections liable to visitations of hog cholera, my plan would be to keep Essex and their grades, and feed them largely on grass. I am confident that we could raise healthier, better, and cheaper hogs by the introduction of more Essex blood, and by feeding more grass and clover. The subject is one of national importance.

If I were not the owner of a single Essex hog, I would say that I believe there is no breed of hogs whose general introduction would prove so immediately beneficial and profitable as the Essex."

In England these hogs are marketed in great numbers when from five to eight months old, for light family pork.

JERSEY REDS.

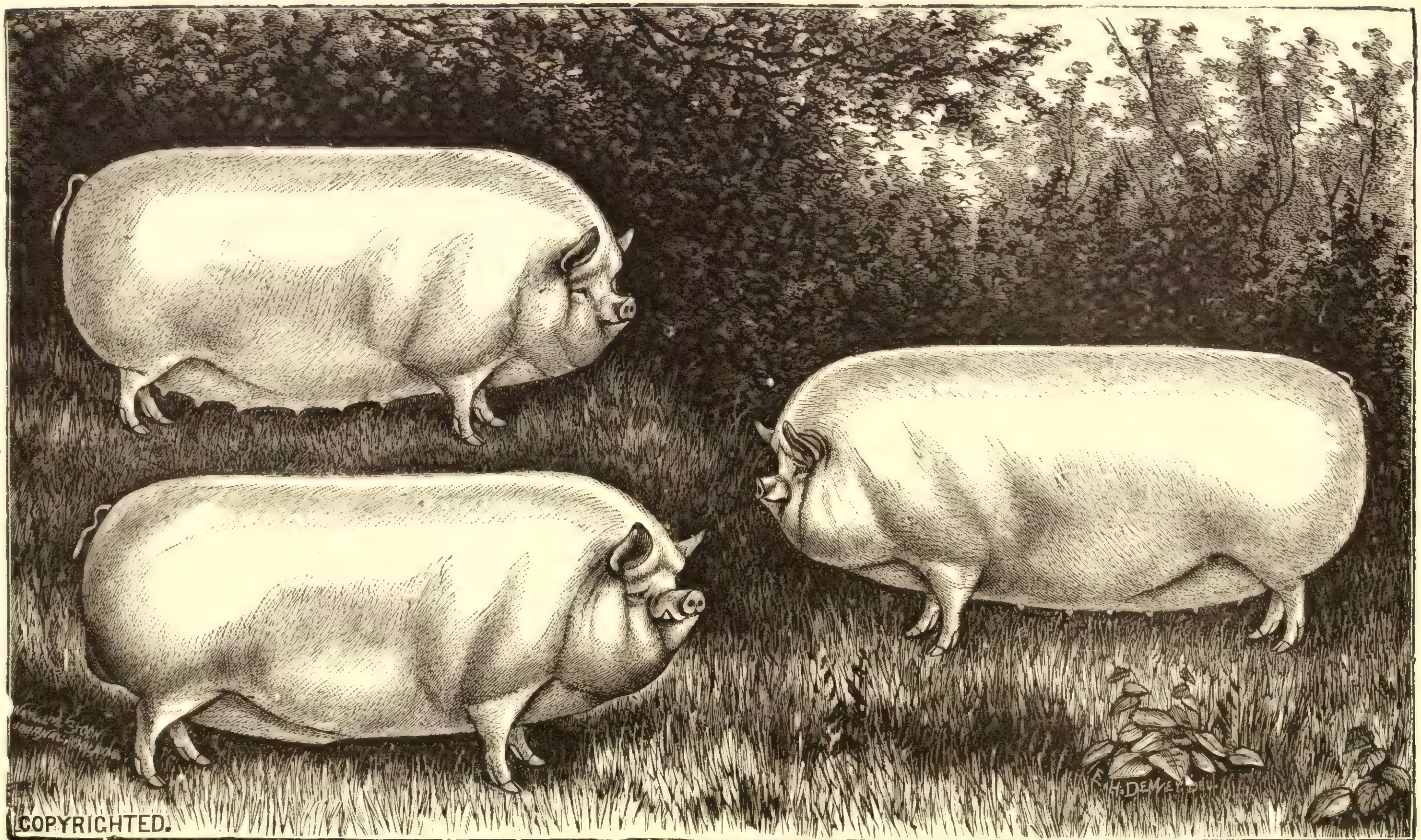
THESE swine have been bred in some portions of New Jersey for more than fifty years, although their origin is not positively known. It is claimed by some that the breed is derived from an importation from England in 1822, by a Mr. Kelsey of Long Island, N. Y., and that moving subsequently to Montgomery County, and these pigs finding a favorable reception, they spread from thence to various States of the Union. However, this may be, it has become to be an established breed, and has many excellent qualities, among the most important of which are unusually heavy weights attained at small cost; the live weight of full-grown, well-fattened barrows generally running from 600 to 700 pounds, and not unfrequently to 800 and even 900 pounds; sows at maturity reaching from 500 to 600 pounds.

Both sexes possess very hardy constitutions, the males being exceedingly vigorous, the sows prolific, and such good nurses as to usually rear a numerous offspring. In this connection, it is said that they are almost entirely exempt from the mange. With respect to their fattening qualities;—the pigs grow very rapidly, weighing at four months, when well fed, from 120 to 140 pounds, and at a year old, 350 to 400 pounds. When put up to fatten, at sixteen to eighteen months of age, they have been known to gain from two to three pounds per day till ready for slaughter. A recent writer in the *Swine Breeder's Journal* says of them:

JERSEY RED.

"Jersey Red swine were most probably descendants of the old Red Berkshire, retaining some of the characteristics of that breed as it existed some thirty years or more ago, when the white markings were supplied by red. They had been improved, as all other distinct breeds were, by careful selection by the farmers of New Jersey, until they had new-acquired qualities as distinct as those of the Essex, Suffolk, or any other well-known breed with marked and fixed traits. The prepotency of the full-blood Jersey Red was such as to appear and generally prevail over the peculiarities of other breeds with which it is crossed, a fact which seems to support the belief that the Jersey Red of to-day is a lineal descendant of the famous old Red Berkshire, which all breeders will understand is very different from the trim, black, restless Berkshire of the present day.

It is a fact that many farmers of New Jersey, after trying other well-known breeds, have returned to the Jersey Reds as the best and safest for the pork raiser. The characteristics of the breed are, as described by the oldest and largest breeders, a good coat of fine red hair, occasionally interspersed with a fleck of black; broad faces; thin, pendant, or wilted ears; good shoulders; large developed hams; broad, straight backs, and excellent middle pieces,



SMALL YORKSHIRES, "MODEL QUEEN," "IMP. KING JOHN," "ROYAL QUEEN."

Property of Geo. W. Harris, "Ridge Farm," Morrisania, N. Y. (Formerly owned by Col. R. Hoe, "Brightside Farm," Morrisania, N. Y.

the whole supported by fine symmetrical legs, with which they rise and travel with apparent ease, even when well fattened, and very seldom showing lameness, which has proven a serious objection to many other breeds. They are apparently mange proof, and fatten at any age from pighood up, until exceedingly heavy weights are attained; good feeders, making them net from 300 to 400 pounds each when from seven to ten months old, and from 500 to 900 pounds each when from one year to twenty-two months of age.

One Jersey farmer raised and slaughtered during the past sixteen years 463 hogs about twenty-one months old, that averaged 538 pounds, and dozens of crops of pigs nine months old dressed 300 to 375 pounds average.

The most notable qualities of the Jersey Red are healthfulness and docility. It was these traits that induced me to try them, preferring, like others, a hog not so liable to cholera, even if not so handsome as some fancy breed. They are also very easily cared for in consequence of their remarkable docility—a trait which seems to show that they are the descendants of a breed well cared for. But their fecundity is also remarkable. Litters are rarely below ten pigs in number.

The Jersey Reds now begin to be sufficiently well known to make their own way into public favor. Practical farmers who have tried them find them very desirable for crossing with smaller breeds. In nearly every case where a practical hog-raiser has tried them, he has expressed surprise that the breed has not been better known and introduced before."

The illustration of this and the Essex variety are made from photographs of animals imported by Benson, Maule & Co., Philadelphia, Pa., and are good representations of these breeds. The Jersey Reds vary somewhat in color, in some instances being of a dark red, and in others of a sandy color patched with white. The color preferred is the red. The head should be small in proportion to the size of the body; body long; ears large and drooping; jowls large. They are large boned, large framed hogs, and excellent feeders.

Duroc Swine.—There is another breed of red swine known as the Duroc, and considered by some to be identical with that of the Jersey Red. They are, however, regarded by many as a distinct breed. It is quite probable that the Jersey Reds and Durocs have their origin in the old time Berkshire, which fifty years ago were of a sandy color marked more or less with black. These hogs attain great weight, breed with more uniformity, and are more fine in some of their points than the Jersey Reds, which they closely resemble.

YORKSHIRES.

THE old, original Large Yorkshire was a very coarse animal, requiring a long time to arrive at maturity, and for this reason, when compared with the Improved Yorkshire, was an unprofitable animal. The first steps taken in the right direction for improving these hogs seem to have been by crossing with the White Leicester, a large breed, with much finer points than the former. Sidney says of the breed thus improved:

"These improved Large Yorkshires are principally bred in the valley of the Aire, in the neighborhood of Leeds, Keighley, and Skipton. They are in great request as breeding stores, and purchased for that purpose for every part of the United Kingdom, as well as for France, Germany, and the United States, at great prices.

These pigs can be fed to 60 stone, of 14 lbs., dead weight, or 840 lbs. The Prize Boar at the Royal Agricultural Fair at Chester weighed, alive, 1,232 lbs. The Prize Sow at the Royal Fair at Warwick, 1,204 lbs. At Northallerton were a fine lot of large sows. There were at least a dozen, each of whose live weight would not be much less than half a ton (1,120 lbs)."

Pigs of this breed have been known to dress at slaughter 225 pounds when less than seven months old, and 489 pounds at twelve months of age. There are three classes of Yorkshires, the large, middle, and small. The first, as has been already stated, attains great weight, while the middle reaches about the size and weight of the Berkshire. The first are invariably hard to fatten, especially when young. The second originated by a cross between the large and small, the latter being of fair size.

Small Yorkshires.—These swine are noted for fine points, they having exceedingly fine bones, small ears, short heads, dished faces, short legs, and produce meat of a fine quality, while they fatten very readily. We are indebted to Mr. George W. Harris, of Morrisania, N. Y., for several years a successful breeder of these hogs, for the following description of the breed:—The head is small, with great width between the ears; face short and well dished; snout very short and broad (not pointed), jowls large and deep; ears small, thin, and erect; neck short, the head, as it were, being set in the shoulders; body large; back broad and straight; chest deep and full; ribs well sprung, giving great width of body; hams broad, deep, and projecting well back; shoulders broad, deep, and square; legs short, and set rather far apart; bones fine and strong, an animal of this breed being very rarely found sprung in the legs.

They show a peculiar fixedness of character, reproducing their like with perfect uniformity. We have noticed that if a pure-bred Small Yorkshire boar be crossed with a sow of any other breed, the progeny will invariably show much more of the characteristics of the sire than the dam; while if a female of the grade thus produced be crossed with a pure-bred Small Yorkshire, the resulting progeny will deviate but little in appearance from the pure-bred animal. But what seems remarkable is the fact that if a pure Small Yorkshire be crossed with the Poland China, the Berkshire, or any other black-haired breed, the pigs will almost invariably be pure *white*, without a black hair upon them, which shows the extraordinary prepotency of this breed.

They are very quiet in disposition, not giving to roaming, not liable to break through fences, and are absolutely unable to get over a fence having a height of from eighteen inches to two feet; they are consequently more easily fenced in than some of the more ranging breeds. They show a tendency to early maturity, fatten readily, and have a small proportional amount of bone and offal. The flesh is of a fine texture and delicate flavor, being much superior to some of the large, coarse breeds. As nurses, I have found them to average as good as other breeds, for, though they do not probably furnish as much milk as the larger and coarser breeds, their pigs require so much less to keep them thriving, that I never yet had a Yorkshire sow that did not furnish milk enough to keep her pigs fat and plump.

SUFFOLKS.

THESE swine are considered by many at present as only a variety of the Yorkshire breeds; however this may be, it is one of the old English breeds, and has been regarded with much favor in making what is commonly termed a "market pig." The Suffolk is not a large breed, it weighing a hundred pounds or something more at the age of four or five months. July pigs, well fed upon milk, ground corn, and oats, or barley meal and potatoes, may easily be made to attain the weight of 120 pounds by Christmas, the season when there is a brisk demand for such pork.

Description.—The description of the Suffolk breed is given in the Swine Register as follows: "Head small, very short; cheeks prominent and full; face dished; snout small and

very short; jowl fine; ears, small, thin, upright, soft and silky; neck very short and thick, the head appearing almost as if set on front of shoulders; no arching of crest; crest wide and deep; elbows standing out; brisket wide, but not deep; shoulders and crop-shoulders thick, rather upright, rounding outward from top to elbows; crops wide and full. Side and flanks—ribs well arched out from back, good length between shoulder and ham; flank well filled out and coming well down at ham. Back broad, level, and straight from crest to tail, to falling off or down at tail; hams wide and full, well rounded out; twist very wide and full all the way down. Legs and feet—legs small and very short, standing wide apart, in sows just keeping the belly from the ground; bone fine; feet small, hoofs rather spreading; tail small, long, and tapering. Skin, hair, and color—skin thin, of a pinkish shade, free from color; hair fine and silky, not too thick; color of hair pale yellowish white, perfectly free from any spots or other color. Size small to medium."

The objections urged by some breeders against the Suffolk are, that they have too much fat, and on account of this tendency to fatten, the sows are not as prolific as they otherwise would be, while they are poor nurses; also that the young pigs are not as strong and vigorous as some breeds, and that their tender skin and thin hair disqualifies them from enduring the cold and exposure of a rigorous climate, while at the same time it blisters and cracks in the hot sun. Still, they are held in very high esteem, and are increasing in favor in many sections.

Breeding Swine.—We have already in this work discussed so extensively the value of thoroughbred stock in improving the common stock of the country, that it seems scarcely necessary to allude to the subject in connection with swine. Whatever advantages may be gained by infusing new and pure blood into one class of domestic animals, may be gained in a corresponding degree in others. The standard breeds of swine have been established by a long and careful system of breeding, which has developed, through judicious management and selection, the desirable characteristics, such as early maturity, readiness to fatten, the form that shall produce the greatest amount of marketable pork with the least amount of waste, etc.

While raising thoroughbred pigs for the butcher may not always be the most economic and profitable course for the average farmer to pursue, still, thoroughbred stock will be necessary to improve those of inferior quality, and secure as many of the desirable qualities as practicable. It costs no more to maintain a good animal than a poor one; in fact, the better the breed the more rapidly they will mature and grow; hence, it costs considerably less to prepare the improved breeds for the market, than the coarse, slow maturing, common stock, and they are consequently more profitable, since they bring a larger return for less outlay.

Pure bred animals also possess the ability to transmit their qualities to their offspring; hence, if a thoroughbred male be crossed with a good grade or sow of large size, we have a progeny that will possess many of the essential characteristics of the former, combined with the vigor of constitution and digestive powers of the latter. In grading up swine, it will be seen that it will be necessary to use only thoroughbred males, selecting the best sows of grades or common stock.

With regard to the selection of a breed, we would not recommend that which has been bred so fine that it has become delicate, and degenerated into effeminacy. Such may do very well for the show pen, but for use, we want a breed that is hardy, with bone and joints fine to be sure, but sufficient to carry a good weight. Some breeds of swine have bred, in-and-in, so fine that the useful points have been bred away, and given place to those of the fancy order. As a general rule, there is much advantage gained when extremes meet, resulting in a medium or middle ground, and this is a safe principle to abide by in both individuals and breeds. The able editor of the *National Live Stock Journal* says on this point:

"The extremes in swine stock — the old sorts, without any refinement, and certain specimens of the new sorts, so refined by breeding selected specimens together, and again interbreeding these, that no stamina remains — represent two kinds of property nobody wants — at any rate, nobody wants either kind if they are thoroughly conversant with swine, the uses to which they are put, and the reason why the hog yields a profit upon his keep.

The idea of delicacy in the hog never entered the mind before he was very materially improved by the refining processes which come through careful selection, sorting out as breeders those with fine bone, ear, and hair. The result in these cases has been very gratifying to those who breed pigs with somewhat the same views that are held by the dog fancier, who breeds the black-and-tan rat dog till the leg and jaw of the dog are not much larger or stouter than the leg and jaw of the rat. This effeminate breeding, of course, refines away the stamina and courage, and such a dog is no equal for the rat, who has, through natural selection, retained his size and vigor, while artificial selection has bred the dog down below the point of usefulness, with neither courage nor other essential remaining.

The hog should not be bred away from the usefulness for which he is kept when men are not led away by an overstrained fancy. In the days when Suffolks held a position second to none, some bred them so fine that the sows would only drop four to six pigs at a time; and if the weather was cool, say in March or early April, to insure that the pigs got hold of the teat, it was necessary to stay with them on the farrowing night, taking the pigs away, one by one, and wrapping them in a blanket till dry, to guard against a chill, and to make sure that they had strength to hold on to the teat when this was offered. They were like infants from very delicate parents, exceedingly difficult to raise to an age when they would seem to take hold with any prospect of living and doing well. Up to this time they suffer, first with the chill of a cool atmosphere, then with blistering and cracking in the sun; next from bowel disturbance, if the dam be even moderately highly fed, and all the time, from a tendency to get feverish, refuse the natural nourishment, showing very rapid breathing, and dropping off in spite of all care, and apparently on very slight exposure.

Now, the hog of good weight may have bone and joint enough to carry him well, without this being objectionable in amount; yet, when the bone gets below this fair size, effeminacy has taken possession of the animal in every part, as the practiced eye will see at a glance. If at this point the breeding of the herd be changed, and the frames and soft tissues be stiffened up by a suitable cross, bad results may be avoided; but if the over-refining process be continued, the effect will be to destroy the value of the herd.

No man should make up a new herd, or add to one already upon his premises, from stock not entirely competent to be 'self-tenders.' At least to be such under circumstances where this is practicable. No man who wants a hog for profit will have his wants fully met until he gets such as are hardy enough to stand pretty severe cold, some neglect, and be quite ready to thrive with plain, even what would be rough feed for the exquisitely bred and pampered hog. The pigs of the stronger kinds, those with plenty of hair and not too fine bone, will survive, though they are farrowed in cold weather, and this, too, without extra care and nursing. More pigs will be dropped at each farrowing time, and it is safe to say that half a dozen strong, well-haired, thrifty sows will raise as many pigs in a season as will be saved and raised by ten sows if exquisitely bred and accustomed to close confinement.

Buyers should see to it that they do not buy from herds where it has been the practice to breed from very young sows and boars. Haste in getting progeny from pigs for which good prices have been paid, is highly censurable. A herd managed on this plan for a few years will dwindle, not only losing size, but becoming effeminate also. The strongest and most profitable stock to buy is found in those herds where the full-grown sows and boars are kept as breeders, and where all the breeding stock, as well as the pigs old enough to run with the sows, are allowed the full liberty of the pastures during the grass season, and plenty of liberty for exercise at all other seasons."

We prefer swine of medium size, and fineness of points, always combining with these a good constitution, early maturity, rapid growth, fecundity, hardiness, and a superior quality of flesh of both fat and lean. The flesh that abounds most in fat is best suited for salting and barreling pork, while such as give a greater amount of juicy, tender, lean meat, are best for hams and tender bacon.

Selection of the Boar. — Whatever the sow may be, the breeder should always use a thoroughbred boar for breeding purposes. A grade hog may perhaps look quite as well as the thoroughbred, but he will not transmit with certainty the good qualities of the breed, and hence will be totally unfit for breeding. What is termed prepotency is possessed only by *pure bred* animals, and hence the value of such for breeding. These qualities have become *fixed* by a long course of careful breeding, while in the grade there is no element of permanence in this respect. Having decided upon the breed, the next step is to select the individual animals. The boar chosen should have a strong, vigorous constitution. The masculine characteristics should be prominent, avoiding such as are of the effeminate order.

On this point, a prominent and successful breeder in the West says he prefers that the male used in breeding should be rather coarser than the average type of any given breed. Another gentleman distinguished for his success in swine husbandry, states that he would go still further, and apply the same rule to the selection of brood sows; that he has found that sows of a coarser, stronger type, were more hardy, more prolific, and better nurses, and that their pigs were usually better than those from sows of a finer, smoother, and more delicate make-up. The inherited health and constitutional vigor resulting from the mating of strong and vigorous parents, will be apparent not only in the number in the respective litters, but also in the size, strength, and qualities that go to the making of a pig that will be worth a good price all of the way from birth to maturity.

The early selection of the boar is especially desirable, for in this way there is a large number to choose from, giving the opportunity to select the best. In breeding for the general pork market, the selection should be very different from that for show purposes alone, in which case a delicate ear, fine tail, and a tendency to fatten rapidly, with other and less important marks, are matters of considerable importance. A natural tendency to fatness, and fatness in the fully developed state are essential in the show pig, but much of the high bred swine of the present day have as strong a tendency to fatness as is well in breeding animals, if large litters are to be obtained. An authoritative writer says on this point:

"The best show pig may come from the smallest sow in the herd, yet, as a rule, it is not wise to select breeders from that class. We want the most size in the shortest time; and, as stated, there are hardly any pigs in these days that do not inherit ample fattening proclivities, so that we can quite safely forego a little of the fat that we may secure in the prospective breeder roominess and tendency to growth. All litters, no matter how well bred, show variations at weaning time, and appearances indicate that we can know the best pig for future use, almost from the start. These appearances, however, are often deceptive, as we find a few months later. The best pig at weaning time may not do as well as expected during the next following three or four months; hence, it is best to watch the development, eventually choosing those having size, with greatest width, depth, and length, combined with the finest points."

In all cases individual merit should be combined with purity of blood and desirability of pedigree in the selection of swine for breeding.

Having once secured a good breed, or having obtained the desired qualities by judicious crossing and selection, every effort should be made to continue to improve it, always selecting those animals that show the best points, and fixing them by breeding only from such. This should always be combined with good care, for the best breed of animals that ever existed will soon degenerate if left to care for themselves, or neglected. Gentle and kind treatment

are of great importance in the management of the boar, inasmuch as his future disposition, whether kind or ferocious, will depend very much upon the management and treatment he receives at the early period of his existence. There should always be firmness combined with kindness, for these animals often become cross and even dangerous, unless managed in a common sense manner.

Selecting and Rearing Brood Sows.—While it is not as essential that the sow should be thoroughbred as the male, in breeding for the pork market, yet it will always be found the best practice (since the results will be correspondingly better) that the best types of animals be selected for breeding in both male and female; therefore whether common native sows or grades be used, the best specimens should always be chosen for breeding, not only in constitutional vigor, but in form, aptitude to fatten, early maturity, tractability, etc. The following sensible advice on this subject, from a prominent agricultural journal, will be found of value to swine breeders generally; and since it accords so precisely with our own views, we quote it entire:

"A brood sow should be a good milker. However good in other respects, if deficient in this, she should hardly be retained as a breeder. An abundance of milk for the first eight or ten weeks of their existence is the best preparation young pigs can have to fit them for profitable growth in after life. It is not always possible to decide with certainty whether or not a young sow will prove to be a good milker; but as with cows, so with pigs, we may learn from observation and trial to know in some degree, judging from their general appearance, what to expect.

Much will depend upon the dam and grandam in this regard. Milking qualities in swine are as surely transmissible to progeny as in cattle. Thus it is true of swine as of cattle that this trait may be greatly improved by selecting only good milkers for breeders, as well as by feeding them when young with a view to their development as milk-producers, rather than as fat-producers. For this reason spring and early summer litters are usually the best from which to select young brood sows. They can be kept through the summer almost entirely on grass, which, if abundant and in variety, will make them grow nicely, and, at the same time, the exercise required in grazing will keep them in good health and thrift. By the time the cold weather comes on, and corn is to be fed, they will have become nearly old and large enough for service. But even after this, continued care should be taken that too much corn, or other fat-producing food, should not be given them. We must, however, bear in mind that at this period all animals naturally lay up fat, which afterwards goes to enrich the milk. Hence, while they should not be allowed to become over-fat, they should yet be so fed as to supply this demand of nature, and to retain the general health and vigor of the system.

When they have dropped their first litter, the most they will need for the first five or eight days will be cooling drinks, and very little rich food. Wheat bran scalded, and then thinned with cold water, to which may be added a handful of ship-stuff or middling, may be given. In ten days or two weeks the richness of the food may be gradually increased, great care being taken, however, both as to the quality and quantity, that these changes may not injure the health of the sow, or so affect her milk as to cause scours in the pigs. It is a very common mistake in feeding sows having young pigs to give them too much strong food when the pigs are quite young.

It is not until the pigs are some three or four weeks old that they really begin to tax the sow heavily. Then it is that the sow should be liberally and regularly fed on good, nutritious, milk-producing food; and, at the same time, the young pigs should be taught to feed by themselves at a trough out of the reach of the sow. If thus managed, both sow and pigs are benefited. The strength of the former is kept up, and her disposition to produce an abundance of good rich milk so encouraged as to fix this as one of the best traits of her

nature; while the pigs, by the extra feed given them, make a corresponding rapid growth, and that at a comparatively small cost.

Young sows brought up in the manner suggested, and thus cared for with their first litters, may be depended on to do as well, or better, with their next, provided they have anything like fair treatment. In case, however, a sow fails to prove herself a good milker, after a fair trial, she should be replaced by one of better promise, unless, for some special purpose, it is thought best to retain her."

The sow should always be gently and kindly treated, and especially during the period of pregnancy. Such sows can always be more easily managed and cared for at the time of farrowing.

Age for Breeding Swine.—It is not only highly important that the boar should be a pure-bred animal, and that both male and female be the best representatives of the breed to which they belong, but that they should be allowed to attain a suitable age before being used for this purpose. Many farmers make a grave mistake by permitting animals to breed before they have become fully developed. By so doing, good results cannot be obtained, for half-grown parents cannot, in the nature of things, produce large, strong, and vigorous offspring. Pigs from full-grown and strong parents will, with the same care and food, produce a larger amount of pork than those from immature ancestors, since they will be larger, more vigorous, and take on flesh more rapidly. If, while growing, the sow is obliged to yield much of her strength and vitality to the production of her offspring, her growth must of necessity be checked, while she will be unable to impart that vigor of constitution, and a tendency to rapid growth to her young, that she would if fully matured before breeding.

Weakness will result as a natural consequence in breeding from immature parents, and weakness in the parents denotes still greater weakness in the progeny, and consequently degeneracy. We believe it is better for sows not to have pigs until they are fourteen or sixteen months old, than much earlier, although some breeds mature much earlier than others.

If the boar should be kept until he is a year old before being put to service, and allowed to serve but a limited number until he is a year and a half old, his offspring will be much stronger than if he had been used for this purpose younger.

A boar may be kept for breeding until he is five or six years old. He will, however, get much better pigs after he is two years old than before that age. Boars are frequently apt to get cross as they grow older; in such cases they should be castrated and fattened. A sow will remain prolific until she is seven or eight years old. Old sows will, as a general rule, bear stronger and better pigs than young ones, and will take better care of them, and have a better supply of milk. When once a good breeding sow is obtained, proving a good mother, she should be retained as long as possible for breeding purposes, as young sows are apt to be poor mothers. The practice with many farmers of discarding the old sows and supplying their places from the young litters is very unwise, providing the old ones are of equal merit. Young sows, however, should be well fed before being bred, in order to bring as strong and vigorous pigs as possible.

Period of Gestation in Sows.—The period of gestation in sows is from a hundred to a hundred and twelve days. There is a variation sometimes of from twenty to thirty days, but this is the exception. Young or weak sows will generally carry their young a shorter time than older and stronger ones. The best time for spring pigs to come is in April, and fall pigs in September. Where two litters are raised from a sow during the year, the first litter should come as early as March, so that the next litter may come early enough in the autumn for the pigs to be weaned before cold weather sets in. The sow should be kindly treated while carrying her pigs. It is well for the breeder to always keep a memo-

randum of the date of service, that he may know when to look for the appearance of the litter.

Managing Brood Sows.—When farrowing occurs in cold weather, the sow should have a place artificially warmed. A stove located near the pen so that its heat may be communicated to it will be necessary under such circumstances. A temperature of not less than sixty-five degrees will be necessary until the pigs are properly dried off, and will take the teat. Young pigs are very tender, and will soon get chilled. It is well to provide warm, dry, well-ventilated quarters for the sow, where she can be by herself, at least two weeks before the time of farrowing. It may sometimes be a good plan to run rye straw through the feed cutter before putting it in the breeding pen. If, however, the sow is isolated in season, she will have sufficient time to break up the straw and make her own bed. Care should, however, be used not to give her too much straw, or the pigs may be smothered in it. To avoid all danger from the pigs being chilled, where no stove is provided for warming the breeding pen, a woolen blanket may be placed carefully over the sow as soon as she has lain down, and there are symptoms of approaching delivery. The attendant should of course stay by, and see that the pigs are kept constantly covered by the blanket, as good care at this time pays well. After the pigs are dried off and have taken the teat well, there will be less danger of their getting chilled. It is a good plan to gentle the sows before farrowing by accustoming them to be approached and frequently handled. Such sows will be more quiet and can be more easily controlled or assisted than those that are wild and nervous. If necessary to check a costive tendency, feed the sow roots, green clover, oil meal, bran slops, etc., for a few days before the pigs arrive. Old and experienced breeders say that a dose of castor oil, even, is not needed in one case in a hundred.

After farrowing, there should be undisturbed quiet and rest for from eight to ten hours. A little salt in the slop, water, or gruel is generally relished at this time, but the drink first allowed must not be sufficiently cold or in such large quantities as to produce a chill. Breeders of large experience recommend scalded shorts as a safe diet for a week or ten days after parturition, to be followed by the addition of a portion of corn meal, seasoning it by mixing a little salt. It should be remembered that during the period of gestation the health of the sow largely influences the health of the pigs. Improper food is frequently given, and too much of it at such times. Indigestion in the sow will produce this difficulty in the young pig. Improper food, such as too much sour slops at the time of farrowing, will derange digestion, unless the sow has access to earth, ashes, charcoal, and similar substances to neutralize the excess of the acid. Sows, when carrying their pigs, should be occasionally supplied with charcoal and ashes, and if kept in a pen, with green food or sod also. If the blood becomes impure through improper food, these impurities will be communicated to the milk, and hence will affect the health of the young pigs.

When left to herself in the selection of food, the sow will instinctively so temper it by seeking alkaline earths, charcoal, etc., in connection with grain and other food, as to prevent acidity and fermentation, which are the two things more than all others that will damage the milk, producing indigestion and a loose condition of the bowels of the pigs. Never allow the sow and pigs to have access to, or lie in a manure pile. Basement stables are decidedly objectionable in this respect. A farmer who permits his sow and her litter to lie in a manure heap need not be surprised if one-half of the litter die, and the rest fail of being healthy. The same may be said of permitting them to lie in a damp bed.

To Prevent Crushing Young Pigs.—In order to keep the sow from crushing the pigs between herself and the wall, a rail or other protection should be placed around the inside of the pen eight or ten inches from the walls, and about six inches from the floor. Sometimes a shelf or piece of scantling is placed around the walls of the breeding pen.

When but little straw is used, this affords a complete protection for the pigs, as it gives the opportunity for them to escape if any should be behind her when she lies down. Such a shelf is easily arranged, and may be removed, if desired, when the pigs are a week or two old.

Preventing Sows from Eating Pigs.—Sometimes the sow will eat her pigs as soon as they are born. This extremely unnatural tendency is the result of a feverish condition of the sow at the time of farrowing. A feverish condition is produced by a constipated condition of the bowels. This condition may be obviated by feeding light, sloppy food, roots, scalded bran with oil meal, etc., for a few days previous to farrowing. Give her also salt meat for three or four days before farrowing, such as salt pork, bacon, or fish, in small bits, and as much as she will eat every day. This will appease her appetite for flesh, the salt is laxative and the sow has no desire for fresh meat. If there seems to be a feverish, restless condition, give her a large quantity of lukewarm water or gruel slightly salted; this will usually result favorably, the sow lying down quietly, and remaining so until through farrowing. An extensive western breeder says on this point:

"The eating of pigs results from an unnatural appetite on the part of the dam, which is caused, usually, by a feverish condition of the system. It does not often become a confirmed habit. We have frequently known sows that had eaten up a whole litter of pigs, to afterwards become careful mothers. On one occasion, we had a very valuable sow that was about to farrow. After she had made up her nest, we noticed that she was costive, feverish, and uneasy. As soon as the first pig was dropped, she got up, and greedily devoured it. She then lay down again, and a second pig was dropped, with the same result. She appeared perfectly frenzied, and eagerly devoured every particle of straw that had come in contact with the liquid that escaped her when giving birth to the pigs. We then hurried off, and brought a large pailful of tepid, salty water, which was placed before her. This she drank as greedily as she had eaten the pigs. She then lay down quietly, dropped eight more pigs, without stirring from her nest, and raised them all."

When the diet of the sow has been properly managed, during the time of carrying her pigs, occasionally giving charcoal and ashes, and green food or sod when confined in a pen, there will be little danger of her eating her pigs. Whenever any sow eats her pigs a second time she should be rejected as a breeder.

Care of Young Pigs.—It is important to have young pigs become accustomed to eating something before they are a month old, instead of having them depend entirely upon the milk of the dam until the period of weaning, as the sudden change of food at that time, and want of milk will be liable to retard their growth. If properly managed, their growth should not be checked for a single day. Mr. Corbin, the author of a work on Swine Husbandry says:

"As to the care of pigs, there is no danger of forcing them along too fast on milky slops and clover. If they gain a pound a day it should be very gratifying; and if they do less, their owner may conclude the maximum of gain is not being attained, and profitably endeavor to find out, as soon as possible, the reason why."

Pigs should be allowed plenty of skimmed milk and buttermilk, mixing a fair proportion of corn meal mush, or wheat and rye screenings ground together. They should also have a plenty of grass as soon as they will eat it. The meal for young pigs should always be thoroughly cooked, as it is then more nutritious and easily digested. Raw, or half cooked meal does not digest readily, and when fed to young pigs not accustomed to it, it will be very liable to bring on an attack of the scours. The pigs should have a little trough by themselves to which the sow cannot have access, that they may be taught to eat.

If by mistake more food is given than can be eaten, it should be removed, as it will become filthy if left, and unfit to be eaten by them. Remove it in some way, that the troughs

may be clean when they are fed again. Some farmers do this by letting in a sow from the yard to eat what the pigs may leave. Little and often is the best rule for feeding young pigs. The younger the pigs the oftener should they be fed. When they are weaned at six weeks old they should be fed five times a day for the first two weeks following. If the sow has no milk at first, the pigs must be fed by hand until the mother is able to supply them. If she is fed with sloppy food she will be likely to have milk in two or three days, if not before. In such cases the little pigs must be fed several times a day; give them all they will eat, but no more. Milk from a cow that has recently calved is best. It may sometimes be necessary to add a little molasses. As the pigs increase in size, the quantity of food given should be correspondingly increased. When pigs are weak at birth, it is generally because one or both of the parents were too young to breed, or were diseased, not well mated, or because the sow had not been properly fed or cared for.

Young pigs thrive best that can have a yard or lot to run in, when the season is such that it is practicable; those that are closely penned for any great length of time cannot be expected to thrive well. The pigs should always be kept as clean as possible, and well ventilated. Dry earth is one of the best and most effective absorbants and disinfectants for pens; it absorbs the liquid manure, and adds much to the comfort and health of the pigs. The troughs should be scalded with boiling water occasionally. Pigs of the same age and size should be kept together as far as possible, but when this cannot be done, there should be an abundance of troughs provided, as the stronger ones will crowd the weaker ones away, and prevent the latter from getting a sufficient supply of food.

One important fact is clearly established in feeding animals, and that is, that the young of swine, as well as all other animals, will make a very much better gain from the food consumed, than older animals. Pigs at from ten to twelve months of age, if properly managed, will give an average of one pound gain in weight per day. This is a larger gain, in proportion to food consumed, than would be averaged in the next ten or twelve months.

Weaning Pigs.—Pigs are usually weaned from six to ten weeks old. At the age of two months their teeth are in a suitable condition to grind food. Spring pigs can generally be weaned a little earlier than those coming in the fall or early winter. As previously stated, they should be fed with milk and buttermilk, mixed with corn mush, ground wheat, and rye screenings, etc., before this period, in order to be kept growing well, and to obviate too sudden a change in food at the time of weaning. They should have grass also as soon as they will eat it. At the age of three months they may be fed on clover, and whole soaked corn. A breeder of swine, of several years experience, gives his views of weaning pigs as follows:

"The time of weaning depends somewhat upon circumstances, but generally at from eight to twelve weeks. If they have been early taught to eat, and have grown well, they may safely be taken from the sow at eight weeks old; but if they are small and poor, they may well be permitted to follow the sow two to four weeks longer. The sow will scarcely suckle them longer than eleven or twelve weeks. The time of weaning is simply a matter of convenience to the breeder. With proper care and attention a pig may be raised without ever sucking the sow at all, and they may be taken off at any age, provided that food of a suitable quality and quantity be furnished them."

It is a good plan to leave one or two of the smallest pigs of the litter with the sow for a few days after the others are taken off, in order that her udder may not become swollen or caked by the collection of too much milk for which there would be no escape, if all of the pigs were removed from her at once.

Castration.—Pigs not designed for breeding purposes should have this operation performed when about four weeks old, or at least two or three weeks before they are

weaned, as it is then less liable to interfere with their health and growth, than if delayed until after weaning. Besides it makes them smooth barrows if done at this age, and obviates the trouble of having a few months afterwards a miscellaneous number of boars on the premises, when there should be only carefully selected animals for breeding purposes. This operation is very simple. The pig may be held from the ground by the hind legs, by an assistant while the operator is at work, or on its back, with the head and shoulders between his knees and the hind legs held apart. With a sharp knife make a small incision into the scrotum, but of sufficient size to press out the testicle, cut the cord with a dull pair of shears to prevent bleeding.

Never jerk to break the cord, it is a cruel and barbarous practice, as the cord may better be severed by more humane means. Sometimes a little melted lard in which a little salt has been mixed is applied to the wound, but there will generally be no need of the application of anything. If on the second day, there should be considerable swelling, a little tincture of myrrh should be inserted into the cavity.

Mr. Coburn gives the following method of castrating old boars: " After drawing up one hind leg, and fastening it securely to a post or stake, fasten another rope around the lower jaw, back to the tusks, draw it tightly and fasten it to another stake; in this position the animal can offer no serious resistance. The cut should be low down, and as small as possible. The low cut will afford a ready means of escape for all extraneous matter, and allow the wound to keep itself clean, there being no sac or pocket left to hold the pus formed during the healing process. It is not best to perform this operation when the boar is very fat, or when the weather is too warm, as the risk is much greater.

Spaying.—This operation is sometimes performed on sows when about three months old, where large numbers of swine are kept. It is, however, a very delicate operation and should never be practiced upon any animal whatever, except by a person who perfectly understands the business and has seen it performed by a skillful veterinary surgeon. A recent writer has well said, " There are a thousand men who can do a tolerable job at castrating, to one that is competent to perform a spaying operation." We would not as a general rule recommend spaying, it is a cruel practice and attended with too much risk. There may be cases when it is desirable, and for the benefit of those who desire such information, we insert the directions for spaying small animals, which are given by Professor Law in his veterinary work. The animal should be sparingly fed on light food for several days before this operation is performed.

" The animal is stretched on its left side, the fore limbs and head being firmly secured, and the hind limbs extended backwards. The hair is shaved from the flank a little below the angle of the hip-bone, and an incision made from above down, extending to an inch in the pig or bitch, or sufficient to introduce the hand in the heifer. Then with the finger or hand, as the case may be, the womb is sought, backward at the entrance of the pelvis in the interval between the bladder and the straight gut. Being found, one horn or division is drawn up through the wound until its end is exposed with the round mass of the ovary adjacent. The latter is seized and cut or twisted off according to the size of the animal. Then the next horn and ovary are brought out, and treated in the same way. The womb is now returned into the abdomen, and the skin accurately sewed up."

There are other methods of performing this operation, but the one previously recommended is usually regarded as the best. An animal that has been spayed should be protected from the cold and storms, and lightly fed for a few days on moist, cooling food. Apply a little lard with which turpentine has been mixed for a few days afterward. There will be danger of trouble from flies, if spaying is performed in very warm weather.

Fattening Pigs.—The best method of fattening pigs is to commence giving them all they will eat while young; this will cause them to grow rapidly, and produce more pork for

the food consumed, than the practice followed by many farmers of letting the pigs go half starved for the first four or six months, thus stunting their growth until a special time for commencing to fatten them is decided upon. It should be remembered that it takes a certain quantity of food to supply the daily animal waste, besides maintaining the increasing growth. The young animal converts more of the food given into flesh than the old animal, because the waste is less in the former than the latter; while the demand for the building material for the bones, muscles, nerve tissues, etc., is greater in young animals than old.

It was formerly supposed by many that old animals would fatten more readily than animals that are young, but it will require no argument to prove the fallacy of this opinion, or to show that the best economy is to feed pigs all they will eat from birth, if the object is to sell the animals when fat. No animal should ever be permitted to lose flesh, at any stage of its growth, for it must of necessity be brought back at an increased expense of food over that previously given, to bring it up to the condition when it began to fail. It is now generally conceded that the most profitable time to fatten swine is when they are young, and that those who keep them to full growth lose much of the profit that would result from fitting them for market sooner.

A breeder of experience says: "The farmer who keeps a pig more than eight months loses twenty per cent.," and advises that pigs be fattened when they are six months old. Wintering hogs with a view of getting heavy weights is not to be advised, unless under exceptional circumstances. The expense of feeding is too great. Pigs weighing from 200 to 300 pounds will bring a higher price in any market than those of any other weight, while the pork from such animals is more tender, delicate-flavored, and much to be preferred for home use than that of the older hogs. Such hogs cut up better into hams, bacon, etc. It will cost much less to feed three pigs to a weight of 200 or 250 pounds, than it will to keep a hog until he shall weigh 600 or 750 pounds, besides the pig pork would bring a higher price in market.

The weight of the stomach of different domestic animals, in proportion to each one hundred pounds of live weight, is in the ox 3 lbs.; in the sheep 3 lbs.; while in the fat pig it is only .66 lb.; so that proportionately the weight of the stomach of an ox or sheep is about five times as great as that of a hog. Notwithstanding the stomach of the hog is comparatively so much smaller than that of the ox or sheep, he is a great consumer of food, and possesses the ability to eat, digest, and assimilate more nutriment in a given time in proportion to his size, than any other domestic animal. Messrs. Lawes and Gilbert of the Experiment Station at Rothamstead, England, who have made experiments in different departments of agriculture for more than forty years past, show by careful tests, that while pigs are usually fed much richer food than oxen and sheep, they still eat about twice as much as a sheep, in proportion to their respective live weights.

They also ascertained that 401 pounds of Indian corn meal and bran (dry) produced 100 lbs. of pork, live weight; while it required 1,548 lbs. of oil cake and clover hay, dry, to make 100 lbs. of mutton (live weight). It is well known that, in proportion to his size, the pig possesses larger and more powerful assimilating organs than other domestic animals; still the fact remains, that he gains much more from a given quantity of food than a well-bred sheep or steer. In regard to this point, Messrs. Lawes and Gilbert, the authority previously referred to, say: "In oxen, the stomach and contents constitute 11½ per cent. of the entire weight of the body; in the sheep 7½ per cent.; and in the pig 1¼ per cent. The intestines and their contents, on the other hand, stand in an opposite relation; thus, of the entire body these amounted in the pig to about 6¼ per cent.; in the sheep 3½ per cent.; and in oxen 2¾ per cent. These facts are of considerable interest, when it is borne in mind, that in the food of the ruminant there is so large a proportion of indigestible woody fibre, and in that of a well-fed pig, a comparatively large proportion of starch, the primary transformations of

which are supposed to take place chiefly after leaving the stomach, and more or less throughout the intestinal canal."

Pigs, as well as all other animals, require a variety of food. No single article of diet can ever in itself meet all the requirements of an animal's system. Swine will probably eat a greater variety of food than any other animal, their diet consisting of various herbs, grasses, clover, roots, grains, fruits, nuts, flesh, fish, etc., when they can obtain it. Hogs will thrive well on good pasturage alone, and will relish red and white clover equal to a cow, while alfalfa is also excellent. Professor Shelton, of the Kansas Agricultural College, after experimenting with alfalfa for several years, states that he does not hesitate to say that one acre of alfalfa is worth as much for hogs as five acres of artichokes; that it furnishes two or three times the amount of food that clover or blue grass does.

Grain seems to be the cheapest food in the west for swine, and the main dependence of the farmers there. When fed in too large quantities, corn is too heating to the system; and too concentrated to be fed alone; consequently other foods are essential in the same connection for keeping the animal in good health and digestion. Artichokes, potatoes, ruta bagas, parsnips, carrots, beets, and other roots are readily eaten by swine, as well as many insects, such as the larvae of the beetle and common grubs of pastures, frogs, and other small animals that they may be able to kill when running in large fields. When permitted to run in large pastures and timber lands, as is the custom at the South, for instance, they will readily devour acorns, nuts, and wild fruits. It is well for swine to run in the grain fields after harvesting, if possible, in order to glean what grain may have been left, besides obtaining a variety of herbage.

Corn, either ground or whole, fed with roots, grass, and a plenty of slops doubtless gives the best results in proportion to its expense, of anything in the grain-raising sections. In the autumn, pumpkins and grain boiled together are excellent for fattening swine. When *thoroughly boiled*, pigs will eat beans, and thrive well on them, although they are not as fond of them as of peas, which they will eat with avidity. Half peas and half corn are generally considered better than either alone. Peas make very firm pork. Oil cake, when fed in small quantities, in connection with other food, is very good for pigs; but when fed in too large quantities will injure the quality and flavor of the pork. It is excellent for breeding sows, as it is nutritious, keeps the bowels loose, and increases the quantity and quality of the milk. Bran is good to be fed in connection with oil meal.

When it is desired that the fattening process progress slowly, in order that the pigs may attain a large size before taking on much flesh, boiled potatoes and milk are very useful for the purpose. Small potatoes may be used to advantage for this purpose. The fattening process can always be greatly hastened by increasing the quantity of corn meal in the rations of the pigs.

Where fat flesh is desired for salting and barreling pork, the food of the pigs in rearing and fattening should contain a large proportion of Indian meal; but where hams and bacon are desired principally they should be fed more largely on grass, clover, sweet corn stalks, amber-cane and sorghum (when the latter have become well silked and headed), for green food, together with skim-milk, whey, bran, or middlings; while meal from oats, barley, or rye should be given instead of that from corn, since Indian meal makes fat flesh much more rapidly than that from other grains, while that from oats, barley, rye, etc., produces a fair proportion of lean meat.

Pigs should always be fed with regularity, and in quantity all that they will eat clean. Never allow them to leave food to be trodden upon and mixed with dirt, to be afterwards eaten, and never put food for them where it will be mixed with mud or dirt of any kind; always give it to them in a clean place. Partially decayed or frozen fruits, roots, or vegetables, should never be given swine, or other stock, as the effect is to disturb digestion, and render other food given less nutritious to the animal.

Cooked Food for Pigs.—The advantages of cooked or steamed food over that of uncooked for animals, have already been discussed in connection with the management of cattle, to which we would refer the reader; it will not, therefore, require further mention in connection with swine, except, perhaps, to give a few additional experiments. In the management of young pigs, whether weaned or not, it is well known to all breeders that cooked food is better than uncooked, since it is more easily digested, better assimilated and nourished, and is more like nature's food for the young pig. There are also many successful breeders of swine who advocate the cooking of food for pigs that are being rapidly fattened for market, and claim that the advantages to be gained thereby abundantly repay the labor and expense attending the process of cooking.

When we consider that the bulk of the grain that is fed to pigs is composed of starch, and that this substance consists of globules or grains contained in a kind of sack, and that to burst these grains, heat must be supplied equal to 162° to 212° F., we can readily see that the heat of the pigs' stomach is not sufficient to fully utilize starch foods; that in fact, these grains must be cooked in order that there may be perfect digestion and assimilation.

Raspail, a writer upon the chemistry of foods, says: "Starch is not actually nutritive to man till it has been boiled or cooked. The heat of the stomach is not sufficient to burst all the grains of the feculent mass, which is subjected to the rapid action of that organ; and recent experiments prove the advantage that results from boiling potatoes and grain which are given to graminivorous animals for food, for a large proportion, when given whole, in the raw state, passes through the intestines perfectly unaffected, as when swallowed."

A Western breeder gives the result of his experiments as follows: "On the first of October, I divided six pigs, of the same litter, into two lots of three each, they being of the same weight and thrift — 225 pounds each lot — placing them in separate pens. Lot No. 1 was fed upon corn-meal, soaked about 12 hours in cold water — all they would eat — with a little early-cut clover hay thrown into the pen for them to chew, to promote health. Lot No. 2 was fed corn-meal, thoroughly cooked, and fed lukewarm, *ad libitum*, with a lock of clover hay. This experiment continued till the 8th of January, or 100 days. Lot 1 consumed 2,111 pounds of meal, and gained 420 pounds — average 140 pounds each. Lot 2 consumed 2,040 pounds, and gained 600 pounds — average 200 pounds each. This gives 11 pounds gain, for one bushel of meal, by lot No. 1; and 16.47 pounds gain, for a bushel of meal, by lot 2. Lot 1 ate, on an average, 7.04 pounds of meal per day, and gained 1.40 pounds. Lot 2 ate, on an average, 6.80 pounds of meal per day, and gained 2 pounds.

"I have no doubt the gain would have been slightly larger in each lot if the meal had been mixed with the clover hay, cut. I have reached, with a larger lot of hogs, 17.20 pounds to each bushel of cooked meal consumed, mixed, before cooking, with a little cut clover hay. This is, however, a larger average than can be counted upon in any large operations."

Mr. Joseph Sullivant, the author of a valuable pamphlet on swine, made a careful examination of all available facts touching this subject, and gives the following as a summary of the result: "I conclude that nine pounds of pork from a bushel fed in the ear, twelve pounds from raw meal, thirteen and a half pounds from boiled corn, sixteen and a half pounds from cooked meal, is no more than a moderate average which the feeder may expect to realize from a bushel of corn, under ordinary circumstances of weather, with dry, warm, and clean feeding pens."

Whether it will pay to cook food for hogs will depend upon circumstances and surrounding conditions, and therefore each farmer must be a law unto himself in this matter, being guided by the facts and circumstances. The cost of labor, fuel, and apparatus being taken into account, it will generally be true that where a man has but few pigs, it will not pay to cook the food, but if he has a large number, it will most assuredly pay, and pay well. Putting it in a different way, it will cost nearly as much to cook food for ten pigs as for fifty or a hundred;

therefore cooking food on a small scale will usually be limited to those small farmers who have warm pens for their hogs and who fatten them in winter, when time and labor are not taken into account.

A well known agricultural writer puts it thus: "If ten pigs are fed 100 days upon 7 pounds of corn-meal each, per day — whole amount, 7,000 pounds, or 125 bushels — and if we suppose that cooking will give five pounds more to the bushel, or 625 pounds of live pork, and this is worth five cents per pound, the feeder will receive $31.25 for the expense of cooking. It is for the farmer to determine whether he could afford to perform this labor for 31¼ cents per day. But if he has 100 hogs to feed, he will receive $312.50 for the 100 days, or $3.12½ per day. It is easy to see that the latter will pay.

In our plan of cooking, we exclude all attempts to feed cooked food in troughs in the open air in cold weather. Nothing but failure can be expected of such attempts. The food will be hot or frozen. Great changes in the temperature of the food is not relished, and food in a semi-liquid state is to be avoided when the temperature is much below 60° F. If hogs are to be fed in the open air, in winter, it should be with dry food. Corn, then, will do best in its natural state; but if the weather is cold, as we have seen, it will require liberal feeding to produce any gain.

In rearing young pigs in winter, some arrangement for cooking will be quite essential to rapid growth. In preparing slops for the brood sows, to cause a generous flow of milk, cooking will be required. Facility for cooking will enable the feeder always to give a greater variety in the diet of young pigs, as well as fattening hogs. In cooking, everything may be used to advantage. Pumpkins, potatoes, carrots, beets, turnips, cabbages, short-cut clover, oil-meal, wheat-middlings — each or all may be cooked with the corn or corn-meal, making a savory mess, greatly relished by pigs or fattening hogs."

Green Food for Hogs. — In the summer feeding for pork, it is well to permit hogs to have access to green food. Pigs after being weaned may be given the freedom of a clover pasture, and thrive well, when allowed in the same connection also, all the milk and slops they will eat, together with cooked corn-meal. Mature hogs will do well on clover and corn, without slops, but should always be permitted free access to a plenty of pure water. Pigs are excellent scavengers, and will effectually root out and destroy the May beetle and other insect pests from portions in which they run. They will also eat such reptiles as snakes, frogs, etc., when they can have access to them. Hogs are very fond of blue grass, orchard grass, red and white clover, alfalfa, pig weed (*amaranth*), purslane (*portulacca*), and other succulent plants; also most of the common pasture grasses.

The field pea, cut just as the peas mature, is excellent for hogs. Sweet corn stalks cut as soon as they are silked; amber cane and sorghum cut after becoming well headed make also a valuable green food. Such stalks are sweet and tender, and the hogs will eat them up clean. Corn for soiling hogs should be planted in drills from two to three feet apart, and sufficiently thick to have the stalks from two to three inches apart. Hogs will always thrive best when permitted to have some green food, and can have access to the ground; in fact, they will not be long healthy without it.

Salt. — Hogs should have a little salt daily, or at least once a week, as it aids in promoting health, and gives a good tone to the stomach. They should also have access to ashes and charcoal occasionally. Animals that are to be used as human food, should be kept in as healthy a condition as possible, not only in respect to the kind and amount of food given, but in maintaining the best sanitary conditions by which they are surrounded.

Pure Water for Hogs. — Hogs should always be supplied with an abundance of pure water; this they require as well as any other animal, in order to be healthy. Some farmers seem to have the idea that hogs are exceedingly filthy animals, consequently that

anything is good enough for them, and that water from a muddy pool, covered with green scum and almost alive, sour slops, and decayed garbage of all kinds, are suitable materials from which to manufacture good healthy pork; but this is a great mistake. The hog would be a cleaner animal if he had the chance, and if pure water were given him in abundance and clean, nutritious food, there would be fewer diseases known among swine than there are at present. Grain-fed hogs, as well as others, will fatten much more readily when given a bountiful supply of good, wholesome water, since water enters largely into the system and also aids assimilation; therefore it is economy for the farmer to do this, even setting aside the comfort it will secure to the animal.

Dr. Stetson, a distinguished writer on swine husbandry, says on this point: "Corn soaked in cold water for from twenty-four to forty-eight hours is rendered very much more digestible in the stomach of the pig than when not so treated. Always keep in mind that the greatest quantity eaten and digested in a given time is the true secret of success in fattening animals.

"A few words as to the importance of fluids in the system to aid assimilation. All animals from man down, that, in a state of health, consume a large quantity of fluids, take on flesh in the same proportion. It is not the nourishment contained in the lager beer of our Teutonic friends that gives them their barrel-shaped abdomen. The same quantity of water, pure and uncombined, with the same amount of nutriment consumed, would produce the same result. Show me a fat man, woman, or child, or any other animal, and if not proven great drinkers, they are the exception, and not the rule."

Hogs should have all the water they will drink, even when fed with milk and sloppy food.

Fat and Lean Pork.—Hogs may be fed so as to produce a large proportion of either fat or lean meat, or a fair proportion of both fat and lean meat, as may be desired. As has already been stated, where a surplus of fat is desired in pork, the food of pigs, in rearing and fattening, should contain a large proportion of Indian meal; but where lean meat is desired principally for hams, shoulders, and bacon, a large proportion of their food should be grass, clover, and other green food, together with skim-milk, bran, or middlings, oat, rye, or barley meal, etc. It is found that when pigs, known to be good graziers, have the run of a clover pasture, which is rich in albuminoids and nitrogenous food, this being a principal source of subsistence, there is no lack of lean meat with the fat, and that the spare ribs, hams, and shoulders are all that could be desired in such cases. But some pigs are better graziers than others, the reason for it being that for many years they have been grown and fattened on food that was only adapted to lay on fat; so that, finally, there is hardly enough lean meat in the pig for the muscular action necessary in moving about. It is a fact well known, that the pig, in its native state, is nearly as lean as a beef animal.

Now if we start with the young pig, by giving it nitrogenous food, such as skim-milk, and a good clover pasture, oats, peas, wheat bran, or middlings, a little oil meal, decorticated cotton-seed meal, rye bran or barley, we shall see, as a result, rapid growth of both frame and muscle, the whole pig being of plump and comely appearance, but not over-fat. A recent writer has truly said: "It is the mode of feeding for so many hundred generations that has transformed our swine into lumps of fat, with a few strings of muscle to tie the ball together." Farmers sometimes forget that the pig is a grass-eating animal as much as the horse or cow, and needs fibrous food to keep his system in a healthy condition. When pigs are raised principally on grass, clover hay that is nicely cured will be greatly relished by them. If fat and lean meat in fair proportion, or what may be called "marbled pork" is desired, a nitrogenous food, as above recommended, should be given; yet in such cases corn should be given at the last stage of the fattening to harden the pork. Corn in small quantities may be fed

all through the life of the pig in connection with nitrogenous food, and the result be a fair proportion of lean meat.

General Management of Swine.—So much has already been stated with respect to the management of swine in a special manner, it would seem that but little remains to be said in a general way on this subject; there are, however, a few points that we would like to impress more fully upon the minds of farmers with respect to sanitary conditions, etc., in the care of swine. The method of managing pigs varies with different localities and circumstances. The dairy farmer utilizes his skimmed milk and whey in the rearing and fattening of swine. In the great grain-growing region, where corn is cheap, pigs are employed as machines for converting this grain into marketable pork in the shortest space of time. In many parts of the South hogs are permitted to run in the extensive timber lands to utilize the natural roots, waste and wild fruit, in connection with the cultivated products of the plantations; there are, however, certain sanitary conditions to be observed in all systems of management, in order to render the rearing of swine attended with profit.

In order to be healthy, hogs should have, in addition to a sufficient amount of suitable food and pure water, pure air, plenty of room—never overcrowding,—and cleanly surroundings. During mild weather, whether growing, fattening, or kept as show stock, or breeding purposes, swine should be permitted to run in a pasture where the soil is dry, and there is a plenty of pure water. There should always be a plenty of shelter provided in sheds, to protect them from cold winds, rains, sleet, and snow. These sheds should be in a dry yard and arranged on the east, north, and west side, so as to be able to open to the south. They should be well bedded with clean straw, and kept especially free from manure. Where swine are permitted to run in too large numbers together in cool weather, they will be apt to crowd together in some warm corner of the shed to lie at night, and pile one upon another in such a manner as to smother and kill those that may lie underneath.

In hot weather in summer, pigs need a cool, airy place to lie and be protected from the hot sun, as well as a good warm bed in winter. Never permit them to lie in a heap of stable manure; it is one of the worst places that a hog can have for a bed. No animal can inhale the noxious gases that arise from such a source any length of time and be free from disease. Hogs kept in barn cellars to work over the stable manure cannot therefore be fit for human food. The bed of swine should always be dry. If obliged to sleep in a damp bed, disease of some kind will be liable to be the result. A swine breeder of large experience says on this point:

"There are certain features in the pig business that are not usually well enough considered. Among these are the *time* spent by the pig in his nest, especially in winter, and the damaging effects of overlying. The hog buries himself, head and all, in his straw, breathes upon it, and this, with the dampness which otherwise naturally accumulates from his body so many hours of each day in the nest, renders it damp and entirely unfit for continued use. If the owner were to sleep upon a damp bed for one night, pneumonia or rheumatism would be quite likely to follow. The pig is subject to the same influences as his owner, and suffers from similar ailments.

Overlying is worse than a merely wet nest, because the hog suffers from overheating, as well as from too much moisture. Hogs come out of a nest in which they have been crowded, steaming and coughing. A winter spent in this manner is quite sufficient to fasten a diseased state upon a herd of swine so treated, for they are as liable to lung disease and rheumatism as man. Hogs contract disease through winter exposures in the way named; wheeze and cough until warm weather, and then measurably recover. Yet, during this period they show no thrift, make no growth, and hence are a source of loss continually.

At the approach of the next fall season they are found to take cold easily, and they require careful management to get them through to killing time. Upon being dressed, an

ulcerated liver and hepatised lung tissue are often found. In fact, any ailment which comes from disordered circulation may overtake the pig that is inadequately sheltered, or is crowded in the nest, even though in the best of shelter. Under favorable conditions the pig will go to a distance from his resting place to deposit his droppings, but if overcrowded or chilled, he will leave his nest with reluctance and relieve himself close at hand, again crowding in among his fellows in the hope of securing that sensation of warmth so grateful to him.

Keeping pigs in this way secures no gain worth the name, while by giving cheap, needed comfort for the farm or village pig, he can be made to pay a better profit that any other beast upon the farm, when all the advantages are considered, the small investment in each pig, provided he is bred and reared by the farmer under economical conditions, and the early age at which he be sufficiently matured for market, for he will, if properly bred and fed, be ripe at any age. The well-fed lamb approaches him in the requisite of being fit for market at an early age, but when we set the product of the ewe (a unit) opposite the brood sow with her seven to ten pigs, it takes no complicated estimate to show the brood sow is the most profitable in enabling us to secure the largest possible returns early from an unpretentious outlay."

It is a good plan to provide a scratching post for pigs to scratch themselves against in the pen. Such rubbing is very grateful to them. The post should have wooden pegs inserted at different heights to accommodate pigs of different sizes.

When swine are treated in a proper manner there will be fewer diseases known among them, and the business of rearing them will be attended with greater profit than the average swine breeder at present realizes.

Is the Pig a Filthy Animal?—The opinion is too often entertained by those having the care of swine, that the pig is an exceedingly uncleanly animal, and delights and thrives in the most filthy surroundings; we believe, however, that this is a charge that is not well founded, and that those having the care of swine are more responsible for such an opinion than the pig himself. It has been the experience of those breeders of swine who have taken the same pains to keep their pigs in as cleanly and comfortable quarters as they do their horses and cows, that swine are fully as cleanly in their habits, and even more so, than a horse, cow, or sheep, either of which after rendering their bedding filthy will lie on it, which is what a pig will not do if he can avoid it. It is a fact, that no hog will ever carry damp or filthy straw to his nest, if he can have access to that which is dry and clean.

If there is a plenty of room in his pen, so that the feeding place is removed from the sleeping place, he will be particular to deposit his excrement away from either locality, which is also what the horse, cow, or sheep will never do. He will not render these portions uncleanly, unless he is forced to do so by overcrowding, which we do when we confine him in a small pen with half a dozen others, and compel them all to sleep in one small portion, perhaps a ten-by-five space, and use the other portion of equal size as a place for the droppings and for feeding, and this perhaps without being cleaned out oftener than once a month, if as often as that. The farmer who manages his cow and horse stables well, cleans them out at least once a day, and sometimes twice, but the pig pen is too often neglected until the pigs are in danger of being submerged. We have, in fact, seen pig pens so filthy that there was not a dry spot upon which the poor animals could make their bed, while in their small yard, they actually swam in the accumulations drained from the barn yard and their own filth; and this too on the premises of those who considered themselves, and were also rated by others in the vicinity, as first-class farmers!

No animal used as human food should be bred in filth. When pigs are treated with the same consideration and care that are bestowed upon the horse and cow, we shall find that he is in fact a cleanly animal, and will never soil either his eating or sleeping place with his own refuse. To those who are skeptical on this point, we would say, give your pigs a roomy,

clean pen, allowing them a fair trial, and they will prove to you the correctness of the above statement.

Bath for Hogs. — Pigs like a place to cool themselves in hot weather, and if they can find no better place, they will wallow in the mire for this purpose, but if given access to clean water, in which they can lie, they will readily avail themselves of the opportunity, and keep clean. The fat pig, like the fat man, is necessarily a sufferer from the hot weather of summer, and when provided with a suitable bath in which to cool himself and cleanse his skin, will be greatly benefited by it.

A Western breeder gives his experience in preparing a bath for swine, thus: "Some years ago we tried an experiment, by making a shallow bath, 4 feet wide, and 10 feet long, of plank, with sides 8 inches high. This, being bedded in puddled clay, was easily made water-tight. The whole thing did not cost more than three hours' labor. Water was pumped from a stock-well near by, and run into this bath by a spout. Gravel was placed some inches deep around the bath to prevent mud. The water could be drawn off through a small box-drain under it. This was drawn off and filled every second day. The pigs did not require any teaching to avail themselves of this aristocratic bath. We have seen seven pigs enjoying this bath at once, while others outside, envious of their enjoyment, were attempting to root them out that they might take possession.

The effect of this bath appeared in every way most salutary, and not a pig in the lot (some 20) but availed himself of it. They kept their skins clean, and the remark was often made, 'that this lot of pigs belonged to a higher class than the mud-wallowers.' We found this plan of summer bath so simple and so cheap that it might be adopted for a large lot of pigs at small expense and labor. Many farmers have water that they can easily conduct into such a bath, and have it full most of the time with little or no expense except the construction of the bath. Our bath was 8 inches deep, but we only let in 4 inches of water, as the pigs would fill the other half of the space with their bodies, and this would fill the vat with water.

During the warmest weather, charcoal, mixed with a small proportion of sulphur, should be kept in a trough, where they can eat it when they choose. We have been in the habit of putting a small amount of sulphate of iron (copperas), in the bath water. It is an excellent deodorizer and purifier. If they drink the water it will not hurt them."

Another writer says, in one of our leading journals: "Some years ago we tested the pig's disposition to keep clean where the opportunity was given, by placing in his pasture a shallow bath of clean water. This privilege was eagerly used, in preference to wallowing in a mud hole a few rods off. This shallow bath was filled with fresh water three times per week, and it was noticed that the pigs seemed always to enjoy the renewal of the water. This certainly indicated a nice discrimination in cleanly habits."

Convenient Piggeries. — This subject will be found treated under the heading of Hog House, in the department of Farm Buildings (Vol. I, page 463).

Kind Treatment of Pigs. — The pig is generally regarded as an obstinate animal, and is commonly treated accordingly. Even on farms where other domestic animals are cared for with the utmost kindness and consideration, pigs are generally the exceptions to the general rule in this respect. We believe that all domestic animals are much more valuable, and the labor of caring for them greatly lessened when kindly treated, since they thus not only thrive better, but are much more easily controlled. All animals on the farm should be managed with firmness, yet gentleness, and by the treatment they receive, should be led to regard the one having charge of them as their protector and friend, rather than an enemy from which to expect blows and harsh tones.

We fully agree with Harris on this point, who says: "If well-bred and *properly treated*, the pigs will go to their own pens as readily as cows or horses will go to their own stalls.

This may be doubted by those who ill-treat their pigs — or, in other words, by those who treat their pigs in the common way. But it is, nevertheless, a fact, that there is no more docile or tractable animal on a farm than a well-bred pig. There is a good deal of human nature about him. He can be led where he cannot be driven.

A cross-grained man will soon spoil a lot of well-bred pigs. They know the tones of his voice, and it is amusing to see what tricks they will play him. We have seen such a man trying to get the pigs into their respective pens, and it would seem as though he had brought with him a legion of imps, and that seven of them had entered into each pig. No sow would go with her own pigs, and no pigs would go with their own mother; the store pigs would go into the fattening pen, and the fattening pigs would go where the stores were wanted. Should he get mad, and use a stick, some active porker would lead him in many a chase around the barn-yard; and when one was tired, another pig, with brotherly affection, would take up the quarrel, and the old sows would stand by enjoying the fun. Let no such man have charge of any domestic animals. He is a born hewer of wood and drawer of water, and should be sent to dig canals, or do night-work for the poudrette manufacturers."

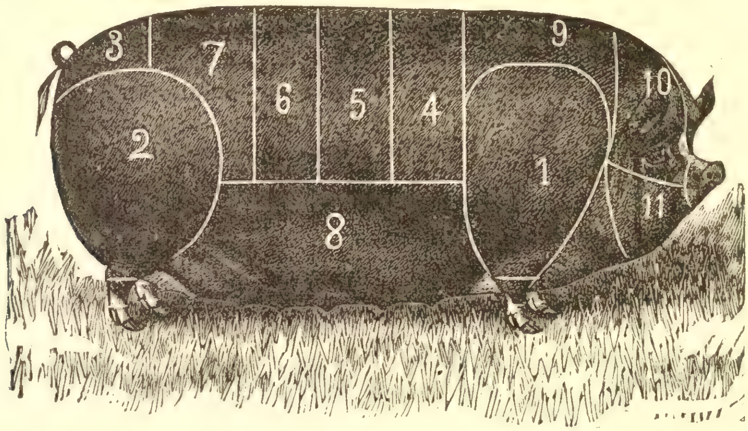


DIAGRAM FOR CUTTING PORK.

Cutting Pork. — The cutting of pork should be done with reference to the use for which it is intended. In the great pork packing establishments, the manner in which it is cut and cured has special reference to the particular markets to which it is to be sent. Sometimes in hams the hip bone is removed at the socket, and sometimes left entire, while the shank is left long to the hock joint, or cut close up to the ham. The shoulder may be cut square back of the shoulder blade and neck, or trimmed off rounding at the upper portion. The bacon pieces may comprise the entire side from the ham to the shoulder, or the flank piece may be separated from the back piece. The whole of the ribs are generally taken out, but sometimes the tips are left in. Mess pork is the side pork containing the bone; clear pork is the side meat containing no bone.

The carcass of a pig is first divided down the back bone into halves. The shoulder, numbered 1 in the diagram, is cut as shown by the lines; number 2 is the ham cut in a circular direction, the bone being sawed through a short distance from the hip joint or whirl-bone. If this piece of bone is removed from the ham, there will be a vacancy produced in which flies will be apt to enter and cause trouble; it is therefore better to let it remain. The rump piece, 3, to which the tail is attached, also 9 and the loin piece 7, may be salted or used fresh; 4, 5, and 6, make good roasting pieces, or may be cut up for chops and cutlets; or the ribs may be taken out, and the whole side, including 8, may be cured for bacon, or be salted. The lower portion, 8, however, makes the best bacon, being made up of thin, alter-

nate layers of fat and lean; 4, 5, and 6, are what the packers call "mess" pork; but when exclusively fat or without lean meat, is called "clear mess" pork.

When used for bacon, this portion of the carcass is cut in long strips, such being very convenient for smoking; when only salted, to be used as salt pork, it is cut in pieces most convenient for packing. The head should be split down the face, and the jowls, or chops, 11, separated. These are generally salted and smoked. The remainder of the head, with the ears and feet, together with the trimmings of the hams, may be boiled and made into head cheese; or the feet, legs, ears, and snout, may be used as pickled souse.

Packing Pork.—Clear, fat pork will never become oversalt, no matter how much salt may be used in packing; a certain amount only being taken by the meat, while the surplus, if there be any, will remain undissolved in the brine. A new, clean oak barrel is best for packing pork. Cover the bottom of the barrel with an inch of dry, coarse salt; then pack the pork in even layers, the skin coming in contact with the sides of the barrel in circles; cover each layer with the same quantity of salt, filling all the spaces. The pieces of pork should be packed as closely and compact as possible. When the barrel is filled, cover the top layer with an inch of salt, and make a strong brine and fill the entire barrel so that the meat will be entirely covered with it. Some simply turn water into the barrel and leave the brine to make itself by dissolving the salt, but we think the first method is to be preferred, as the salt then takes effect at once upon the meat. Never pack pork until it is *entirely cold*, or until all the animal heat has left it, which will require more time than one would suppose. Brine should also never be put to the meat until it is as cold as may be.

Pork cured in the above manner will keep sweet in any climate or weather; but it must always be kept covered with brine. Small, floating pieces must always be removed from the barrel. Never pack any joints or bloody scraps with the clear pork; hams, shoulders, back-bones, etc., must be packed by themselves. Never pack pork in a barrel or cask that has been used for any other purpose. From forty to fifty pounds of salt are generally used for a barrel of pork, but if double this quantity be used, no harm will result for reasons previously given. The best quality of salt should always be used. Sometimes a small quantity of saltpetre is put into each barrel. This hardens the pork, and gives it a reddish color. Pork should always be kept well covered with brine, and the barrel should be looked into occasionally to see that it does not leak. Carelessness in this respect has sometimes caused the loss of large quantities of meat.

Curing Hams and Bacon.—Before putting into the pickle, the hams and shoulders should be trimmed in such a manner that there will be no loose masses of fat lying at the lower end; all such pieces should be cut off and tried up with the lard. The hams, shoulders, and other parts of the animal, counting bones as well as the pieces designed for bacon, should be salted by themselves, and never with the clear mess pork. These should be cured just enough to season them for cooking without freshening, as the smoking is in part a preservative process; besides, if made so salt as to require freshening before cooking, the fine flavor of the meat is lost, and its quality greatly injured. If any portions of the meat to be put into the pickle are bloody, the blood should first be washed out; otherwise it will soak out in the pickle, rise to the top in a bloody scum, and finally taint all the meat. A syrup or molasses barrel, made from cypress wood, makes an excellent barrel, and is easily obtained, for pickling hams and bacon. There are various recipes in use for curing hams and bacon, by both the method of dry salting and pickling, some of which are as follows:

For 100 lbs. of bacon or hams: Take 4 gals. water, 6 lbs. of salt, $2\frac{1}{2}$ oz. saltpetre, $1\frac{1}{2}$ lbs. A or granulated sugar; boil and skim carefully, and turn on when cold. The same receipt is equally useful for beef, during all except the hot months.

Another method: Make a pickle in the proportion of a pound and a half of salt, and half a pound of sugar to a gallon of water. Boil and skim; and when sufficiently cool, pour

it over the meat in sufficient quantity to cover it well. In six weeks or two months they will be sufficiently cured to take out, dry and smoke. Small hams and shoulders will of course cure much sooner than large ones. Saltpetre causes meat to retain its red color.

The following is also highly recommended by those who like spice-flavored meats:

For 100 lbs. of meat take 7 lbs. of good salt, 3 lbs. of brown sugar (or one quart of molasses), 2 oz. of saltpetre, and 2¼ oz. of cloves; 2 oz. of black pepper may also be used, if it is not distasteful to those who are to eat the hams. Pepper is used merely to prevent attacks of flies. Boil all the ingredients in sufficient water to cover the meat when closely packed in the cask. Skim and cool before pouring over the meat. The same ingredients can be used for rubbing the hams, if this mode is preferred to a pickle. For rubbing, however, it is better to add another pound of salt and half a pound of sugar to the above ingredients. This pickle is equally good for hams, shoulders, bacon, corned beef, and dried beef. When corning beef, the meat should be well rubbed in salt, and packed closely in a cask two days before it is pickled. This extracts the blood, and the meat must be taken out and washed before packing for pickling.

Another pickle for fifty lbs. of meat is sometimes made of 3 lbs. of common salt, 2 lbs. of bag salt, 6 ounces of sal prunella, and 4 lbs. of brown sugar.

Still another for the above quantity of meat is prepared from 4½ lbs. of common salt, 3 oz. saltpetre, 3 ounces sal prunella, and 4 lbs. brown sugar.

The following is a favorite English method for curing bacon and hams: Half a pound of saltpetre is pounded very fine, and then divided equally,—half for the two hams, and half for the sides. For bacon, the powdered saltpetre is then rubbed into the meat on the flesh sides, and the meat is afterwards laid on a bench or table in a cool room, with the skin side down, where it remains twelve hours. Seven pounds of salt and one and a half of brown sugar are then well mixed and heated in a frying pan, and thoroughly rubbed while hot all over the meat. The meat is then put into a salting tray or cask, and the brine begins to form. The meat is well rubbed and basted with the brine every other day, and turned, the bottom pieces being put on the top. After four weeks of this treatment, the meat is hung up to dry, and then smoked. The hams are treated in the same manner, except that 4 lbs. of salt and 1½ lbs. of brown sugar are used. These remain in the pickle five weeks, and are turned every day. The meat is not smoked until quite dry on the outside, or until the salt crystalizes upon the surface.

For dry salting, a table, bench, or platform of boards will be necessary, where the drip will do no harm, or so constructed that it may be conducted into a pail. Mix a pound and a half of brown sugar with every four pounds of salt; rub the hams with it thoroughly all over every day for a week, laying them down on the skin side; afterwards every two or three days for two more weeks; then brush off the salt and smoke.

Smoking Hams and Bacon.—After being properly cured, hams and bacon should always be thoroughly dry before being smoked. The meat should be hung up in a dry place for three or four days after curing, in order to drip and have the surface become thoroughly dried. In smoking, be careful not to heat the meat. Some prefer to smoke the meat once in two or three days, taking considerable time for it; others consider five or six consecutive days sufficient. Where there is considerable meat to smoke, a smoke-house will be a necessity.

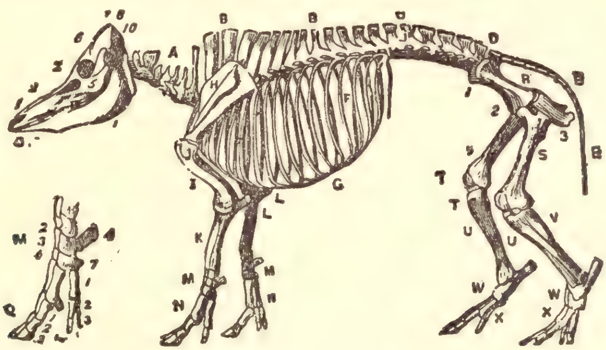
Corn cobs are excellent for smoking hams or bacon, as they impart a sweet and pleasant flavor. Green hickory or sugar maple chips are also good for this purpose. Some prefer the sawdust of these woods, or small brush, to chips. Burr oak wood is also used for smoking. The French use damp wheat straw for this purpose. The smoke should be applied to the meat cold. The temperature of the smoke-house should never be above 80°, and hams should never be allowed to freeze, either before or after smoking. After being well smoked and dried, the hams should be put in bags made of common unbleached cotton cloth, well sewed,

and covered with a coating of whitewash or other preparation, to protect from flies. A farmer who is famed in his section for the quality of his hams and bacon, gives his method of smoking as follows:

"After the meat is sufficiently salted, it should look bright and clean, should be hung up for three days in a warm, dry place, to drip and dry thoroughly, and then smoked. Five days' consecutive smoke is enough. Some careful men take a long time, smoking once every few days, keeping in the smoke-house meantime. I have no smoke-house, and my rule is to smoke for five days, burning corn cobs, then hang in a dark, dry place, of even temperature, using as desired until about the first of May; then I smoke the pieces again for a day or two, wrap in newspapers, and hang in cotton bags made for the purpose, into which the meat is slipped, the end tied up, and the whole hung in a dry cellar."

Mr. H. Stewart says: "To preserve bacon or hams, they may be packed in a common pine packing case or dry goods box, first laying in a bed of the sweetest hay; that with some sweet vernal grass in it is the best; each piece of meat is then wrapped separately in the hay and packed closely, with hay between the pieces; a thick layer is placed on the top, and the box is closed and kept in a dry, dark closet. This is better than papering and canvasing.

The smoking should be done a little each day, and no heat produced—only enough to dry the meat thoroughly. If the meat is dry it will never mould while kept in a dry warm place, and it will improve in flavor for almost any length of time."



SKELETON OF THE HOG.

NAMES OF THE BONES.—*A*—Cervical vertebræ. *B, B*—Dorsal vertebræ. *C*—Lumbar vertebræ. *D*—Sacrum. *E, E*—Coccygeal bones. *F, F*—Ribs. *G*—Costal cartilages. *H*—Scapula. *I*—Humerus. *K, K*—Radius. *L*—Ulna. *M*—Carpus, or knee. 1. Scaphoid. 2. Semi-lunar. 3. Cuneiform. 4. Trapezium. 5. Trapezoid. 6. Os magnum. 7. Unciform. 8. Pisiform, *N, N*—Large metacarpal, or cannon. *O*—Small metacarpal. *P, P*—Sesamoid bones. *Q, Q*—Phalanges. 1. Os suffraginis, or pastern bone. 2. Os coronæ. 3. Os pedis. *R*—Pelvis. (Fore-leg of pig. Phalanges 1, 2, 3). 1. Ilium. 2. Pubis. 3. Ischium. *S*—Femur. *T*—Patella. *U*—Tibia. *V*—Fibula. *W*—Hock. 1. Os calcis. 2. Astragulus. 3. Cuneiform magnum. 4. Cuneiform medium. 5. Cuneiform parvum. 6. Cuboid. 3, 6. Cubo cuneiform. *X*—Large metatarsal. (Hind-leg of pig. Phalanges 1, 2, 3). *Y*—Small metatarsal. *Z*—Head. 1. Inferior maxilla. 2. Superior maxilla. 3. Anterior maxilla. 4. Nasal bone. 5. Molar. 6. Frontal. 7. Parietal. 8. Occipital. 9. Lachrymal. 10. Squamous-tempoid. 11. Petrous-tempoid.

Some bury the ham in a bin of shelled corn, to protect it from flies, after covering it with canvas. When well cured, dried, and smoked, it will not get mouldy by being packed in this manner.

Skeleton of the Hog.—The illustration of the skeleton of the hog will serve to give a correct idea of the anatomy of this animal. The first series of figures following the capitals refer to the bones of the fetlock and feet. The figures that follow Phalanges 1, 2, 3, refer to the bones in the hind part of the body. The last series of figures following Z—Head, indicate the bones of the head.

DISEASES OF SWINE.

SWINE are subject to comparatively but few diseases, and these are most of them of a malignant, epidemic, or contagious form of a serious nature. Many of the ailments of swine are brought on by a lack of sanitary conditions, such as filthy, ill-ventilated pens, overcrowding, improper food, exposure to storms, and cold weather, the use of unhealthy and badly-mated breeding stock, etc. To prevent diseases in swine, as with other domestic animals, is much more easily accomplished than curing, as by good care and management many diseases may be prevented that cannot be cured. Other hogs should never be admitted among the herd, until, by keeping them apart for some time, it is ascertained that they are entirely free from any contagious disease.

As soon as an animal is found to be ailing, it should be at once isolated from the others, unless it be a case of some very malignant disease like the hog cholera, when we would advise that the animal be killed at once and deeply buried, while every place where contagion may possibly lurk should be thoroughly disinfected. This, if accomplished in season, may save the breeder great loss, in checking the spread of the disease. Medicines can best be given hogs mixed with their food; but if the patient is so feeble that he will not eat, or drink, it will be necessary to pour it down his throat, if given at all. In warm weather, when a pig is so sick that he refuses to eat, it may sometimes be well to turn the animal into a field where there is plenty of water and shade, and permit him to shift for himself for a few days. In such cases the animal will sometimes burrow a deep hole in the ground, into which he will get and lie from twelve to twenty-four hours, when he will come out apparently all right.

In cold weather a sick pig should have a warm, clean bed in his pen, with plenty of pure air and fresh water, and all the gruel slightly salted that he will eat. When a pig is taken sick, it will be well to investigate and see if it is not the result of wrong management. The pens should be cleaned out, and all the decaying filthy material scraped from the floor, under and around the feeding trough. Scald the troughs in boiling water, letting them remain in the hot water until they are perfectly cleaned; then sprinkle carbolic acid about the pen, or chloride of lime to disinfect it, the former being the best. Dry earth is also an excellent disinfectant, as well as absorbent of both liquid and solid manure, for use in pens where pigs are kept. The walls of the pen should also be whitewashed, while crude petroleum may be used for washing the wood-work, such as troughs, floors, etc.

Cleanliness is the great preventative of disease, and under proper sanitary management there will be few diseases, except those taken on exposure to contagion, and even in the latter case, there will be less liability of contracting such contagion when animals are well cared for, with all the essential conditions of health observed. Give the hogs clean, well-ventilated pens, a large yard or lot in which to exercise, a sufficient supply of sweet and pure water, and access to fresh earth at all times, always avoiding over crowding, and they will seldom, if ever, be troubled with disease of any kind. Whenever veterinary aid seems necessary, a competent veterinarian should be employed; but ignorant quacks should be avoided: they kill more animals by their nostrums than they cure.

Apoplexy.—Sometimes called "staggers" or "congestion of the brain," is not unusual in very fat hogs. It is generally attended with a constipated condition of the bowels, a hard, rapid pulse, and a red, inflamed condition of the eyes. The animal will appear stupid, and as the disease progresses will sometimes become wholly or partially blind, going in a circle or striking against objects, falling at last unconscious, when the limbs stiffen, froth issues from the mouth and the breathing is deep and hard. Sometimes the attack is sudden, and the animal falls without other symptoms being previously noticeable. Cold water is an excellent application for the head at such times, it being permitted to fall on the head from a

considerable height; in the same connection give as quickly as possible an injection of warm water; this to be followed with a mild dose of Rochelle salts and sulphur. Ipecac given in water, to induce vomiting, is sometimes resorted to in place of the purgative. Bleeding will often be attended with good results. Light feeding for a few days will be essential if the patient improves. With all animals attacked with this disease recovery is doubtful.

Colic.—The symptoms of colic in the pig are similar to those described in the other domestic animals, it being attended with great distress. Pigs are the most difficult of all animals to administer medicine to, owing to the trouble of handling them. Give in warm milk a full dose of castor oil, together with two teaspoonfuls of powdered, or one of the extract of ginger. An injection of warm water, when it can be given, will also be beneficial.

Constipation.—Although this may not properly be called a disease, yet if neglected will be liable to lead to many serious ailments, and should therefore be corrected as early as possible. Frequently, a change of diet will be all that will be essential to effect a cure. Cotton seed meal, or oil cake given in moderate quantities with warm bran makes an excellent food for relieving a constipated condition of the system; also flax seed tar, or slippery elm water. If these prove ineffectual, an injection of warm water, in which an ounce of Epsom salts has been dissolved, or with a little castor oil or linseed in it, should be given. In summer, plenty of green clover and roots will usually remedy the evil.

Diarrhea.—This disease is liable to carry off many little pigs in the herd, and injure those that survive the attack, which is generally during the first ten days after birth. The difficulty is usually occasioned by feeding the sow improper food, which affects injuriously the character of the milk. Sometimes improper food eaten by the pigs at the time of weaning, or before, will bring it on. It is also frequently occasioned by breathing impure air, drinking dirty water, or by taking cold. Pigs should never be exposed to storms, or be obliged to lie in a cold, wet bed. Pens located on damp, undrained land, will be the cause of many ailments to the swine.

Give good, nutritious food, and put a mixture of powdered charcoal and salt where the sow and pigs may eat all they will of it. If pigs are attacked before being weaned, give the sow dry food for a few days. Two teaspoonfuls of prepared chalk per day is a good remedy; also fresh scalded milk in which wheat flour is well cooked, it being made into a gruel, will be excellent for the little pigs. Warm ginger tea, in which is a small dose of castor oil, both to be mixed in scalded milk, is also beneficial. Care should be exercised in this disease not to bring on a constipated condition of the bowels, by giving food or medicine that has too much of an astringent tendency. By looking well to the *cause* of the difficulty and the sanitary condition of the swine, the disease may be avoided altogether.

Fractures.—Fractures occasionally occur in swine, but from the obstinate nature of the animal, but little can be done in the way of treatment. When the fracture is of a simple nature, put the animal by himself, giving him plenty of good food and drink, and let nature effect the cure; but if it be of a serious nature, the animal had better be slaughtered at once for food, and put out of its misery, as this would not only be the most humane, but the most economic way of disposing of him.

Hog Cholera.—This disease is known by various names, such as swine plague, hog cholera, hog fever, stye fever, etc. This is a terribly fatal disease among swine, more losses having been sustained from it than any other disease known to swine breeders. In some herds it will appear in a mild form, and it may be weeks and even months before the disease is recognized; in others, large herds will be almost entirely swept off in a few days. It is very contagious and virulent, and if not generated directly by unsanitary conditions, such as crowding together large numbers, foul pens and yards, eating improper food, drinking impure water, breathing poisoned air, etc., such conditions cause it to develop very quickly when the

germs are once introduced from other sources. Dr. Stetson, who has given much time and attention to the investigation and treatment of this disease says: "Neglect of sanitary laws is the chief factor in generating this fever, and no instance can be found where it has originated *de novo*, unless there has been a palpable violation of these laws.

The massing together of large numbers of hogs always has been, and ever will be, the most fruitful cause. In more than one instance have I known this disease to originate from hogs being confined to the drinking of water from shallow ponds, surface water, and also to their being confined to the drainage of manure heaps. It is just as necessary for the hog to breathe an untainted atmosphere and have pure water to drink as it is for the human family. This disease only originates from neglected sanitary regulations, and like its congener in the human family, the typhus fever will become, with proper hygiene, a thing of the past. A hog wants something besides food; he must have pure air and a well-ventilated apartment, with pure water, and not the stagnant water of his own cesspool. There is death in bad air, and impure water is not safe for even a hog to drink."

It is supposed that the germs of this disease may be carried to a considerable distance in the air, without any direct means of communication.

Symptoms.—The symptoms of this disease vary somewhat according to its type, the season, and temperature. There will generally be great weakness and prostration, accompanied with considerable fever, the temperature of the body often being as high as 105° F., as indicated by a clinical thermometer inserted into the rectum. The animal shivers; the nose is hot and dry; pulse weak and rapid; eyes sunken and dull; there is great thirst; quick breathing, a hard dry cough; the skin hot and sore, sometimes having red and dark spots. The bowels are also very sore, and the animal will frequently show great distress, if handled or made to move about. In the early stages, the animals have sometimes a constipated condition of the bowels, but as the disease progresses, a fetid diarrhœa sets in, and bloody matter is often passed, showing an ulcerated condition of the bowels. The last stages are denoted by stupor, paralysis of the hind limbs, involuntary motions of the bowels, etc.

Treatment.—Various remedies have been tried for this disease, some of which in certain cases have been found quite beneficial, while in others no medical treatment whatever seems to be of any avail. We would advise to kill and bury deeply or burn the carcasses of all animals affected, unless they can be treated in a place at a distance from all others, where the atmosphere is constantly disinfected by the use of carbolic acid. In such cases give two ounces of castor oil, and when it has operated, give two or three times a day twenty grains nitrate soda, and eighteen grains nitrate potash, mixed in a little milk or gruel, and let the animal have powdered charcoal in the water it drinks, which should be pure.

A Western breeder recommends the following remedy: "Twelve grains of quinine to each hog weighing 250 pounds, or at the rate of five grains for each 100 pounds will, I think, prevent any hog or pig dying that is well enough to eat.

For 40 pigs weighing 250 pounds each, I take one bushel of common wheat bran, put it in a tub, and pour boiling water over it, and cover it with a blanket or cloth after thoroughly mixing it about as wet as it will stand, not to run. When it has cooked about to blood heat, I mix the quinine in, and having put the pigs into clean pens, feed the bran and quinine, and have never known it to fail to at once arrest the disease, and cure all the pigs you could get to eat. It is simple and cheap, and worth a trial. I have at different times induced my neighbors to try it with like good results."

Another remedy, highly recommended by some breeders of swine, is five grains of calomel, one drachm nitrate of potash, and ten grains powdered camphor, given in a little gruel three times a day, omitting the calomel after the third day. Keep the sick animals entirely by themselves.

Preventive measures are far better than curatives in this disease, for if a treatment could be devised that would save the life of a hog having it, such an animal would prove of but little value afterward, unless the attack were an exceptionally mild one, for the animal would require so long a time to entirely recover from its effects, that it would in the end, as a rule, be a loss to the owner.

Preventive Measures. — The best preventive measures to be adopted for this swine scourge is to maintain the best possible hygienic conditions; as previously stated in the same connection, carbolic acid given two or three times a day in the water for drinking has proved very beneficial in many instances. A gentleman in France who is an extensive breeder of swine states that this disease, known in that country as *rouget*, is often the occasion of great loss there, but that he has escaped losses from this cause by disinfecting his piggeries, and by giving in each full-grown pig's food a teaspoonful of a mixture consisting of two and one-half ounces of pure carbolic acid, and one gallon of common vinegar; and also by giving them occasionally a moderate dose of nitre or sulphate of soda.

Dr. Stetson says in this connection : "As nothing ever did or will exist without an adequate cause, there must be a cause for hog cholera. Now, if the cause can be effectually destroyed, all danger will be avoided, and the swine grower can have reasonable security that his herds will be protected. I am not prepared to say that such an infallible antidote has been discovered, but this I can say in all good conscience, that during a period of fifteen years or more I have been in the constant habit of giving my hogs carbolic acid to prevent this disease among my own hogs, and that thus far I have escaped beyond my most sanguine expectations. I do not say that this disease has not broken out, but if so it has been in so mild a form, and the losses have been so trivial, that no one but a person on the constant lookout would ever have suspected disease.

I have used the various preparations of carbolic acid, and for the past few years only the crude acid, which contains not only carbolic acid, but all the other uncrystallized acids of coal tar. This crude carbolic acid is of about the color and consistence of pine tar. From long use I am satisfied that it has the same or equal prophylactic virtues as the crystallized acid, and at a much less cost. I purchase by the gallon, and give it to my hogs in the water they drink. I suppose it is possible to give it in poisonous quantities, but my experience teaches me that there is little or no danger to be apprehended on that score. For more than a score of years my hogs have got their water from what is known as a hog waterer. This is made by connecting two barrels with gas pipe, and fed from a reservoir higher than the barrels. To prevent the water overflowing in the barrel connected with the reservoir, it is supplied with a valve and float, which will control the water to a desired height. Into the barrel with the float I introduce a pint or more of the crude acid as often as once a month, if 100 or more hogs drink from the barrel. The water, in its passage from the fountain through the barrel with the float to the barrel from which they drink, keeps their drinking water constantly impregnated with the acid, and the peculiar scent of the acid is an evidence that it is not exhausted. I endeavor to have this scent constantly in the drinking water, and fresh additions are necessary to keep it up.

In the absence of such a watering arrangement, the acid may be given in their water or swill trough. If a small quantity is given each day no harm will be done, but as often as once in each week is imperatively demanded. The quantity of the acid for a single hog never entered into my calculations. I should think a tablespoonful, or half an ounce for ten hogs, would be sufficient, and my own hogs get very much less."

Dr. Detmers gives, as the result of his investigations, the following conclusions respecting preventive measures: "The most effective means of prevention that can be applied by the individual owners of swine consists, first, in promptly destroying and burying sufficiently deep and out of the way the first animal or animals that show symptoms of swine plague, if

the disease is just making its appearance, and in disinfecting the premises, or, if that is difficult, in removing the herd at once to a non-infected place, or out of the reach of the infectious principle. If possible the herd should be taken to a piece of high and dry ground, free from any straw and rubbish — if recently plowed, still better — and there should receive clean food and no water except such as is freshly drawn from a well.

If this is complied with, and if all communication whatever with any diseased hogs or pigs is cut off in every respect, which is absolutely necessary, and still danger should be anticipated, for instance, if one or more animals should have become infected before the herd was removed, or a possibility of either food or water for drinking being or becoming tainted with the infectious principle should exist, the danger may be averted, or at least be very much diminished by administering three times a day in the water for drinking either some carbolic acid (about ten drops each time for every 150 pounds of live-weight), or some hyposulphite of soda (a teaspoonful for every 100 pounds of live-weight), till all danger has disappeared.

Second, where swine plague has been allowed to make some progress in the herd, or where the presence of the disease is not discovered until several animals have been taken sick or have died, others have become infected, the best that can be done is to separate at once the healthy animals from the diseased and suspected ones; to place the healthy animals by themselves and the doubtful ones by themselves; to separate, disinfect, and treat the animals in the way just stated. Special care must be taken to prevent any communication, direct or indirect, between the three different parts of the herd. If one person has to do the feeding, etc., he must make it a strict rule to attend always first to the healthy animals, then to those considered as doubtful, and last to the sick ones, and must never reverse that rule, or go among the healthy hogs or pigs after he has been in the yard or pen occupied by the others.

If possible each portion of the herd should have its own attendant, who should not come in contact with any of the others. The separation must be a strict one in every respect; even dogs and other animals may carry the infectious principle from the diseased animals or from the yard occupied by them to the healthy hogs and pigs. Buckets, pails, etc., which are used in feeding the sick hogs should not be used for the healthy ones, because the infectious principle may be conveyed by them from one place to another. Last but not least, it is very essential that the yard or hog-lot occupied by the healthy portion of the herd be higher than that occupied by the others. If it is lower, and especially if it is so situated that water and other liquids from the other hog-lots can flow into it, or over it, the separation is worse than useless, for then the healthy portion of the herd will surely become infected unless the ground is exceedingly dry.

Third, whenever swine plague is prevailing in the neighborhood, any operation, such as ringing, marking by wounding, or cutting ears or tail, and castration and spaying particularly, must not be performed, but should be delayed until the disease has disappeared, or does not exist anywhere within a radius of two miles. If such operation should become absolutely necessary, the wounds must be dressed at least once a day with an effective disinfectant, for instance, with a solution of carbolic acid or thymol, till a healing has been affected.

Swine plague is very often communicated from herd to herd and from place to place by a careless, and, in some cases, even criminal contamination of running streamlets, creeks, and rivers with the excrements and other excretions of diseased hogs and pigs, and with the carcasses and parts of the carcasses of the dead animals. This source of the spreading of the disease can be stopped only by declaring such contamination of streamlets a nuisance and making the offense punishable by law. Allowing swine affected with the plague to have access to such streamlets should be considered as constituting good evidence of such a contamination, as also the throwing of dead hogs, or parts of a carcass, into such streamlets, creeks, or rivers.

The rendering tanks established in almost every locality in which swine plague is or has been prevailing, contribute very much, directly and indirectly, to the spreading of the disease. They contribute directly by disseminating the infectious principle wherever the tank-agents, who collect the dead hogs from the farmers, travel with their wagons; and by contaminating and infecting, in many instances at least, the waters of streamlets, creeks, and rivers with such parts of the dead hogs as are not worth rendering, but which constitute the principal seat of the morbid process. Indirectly they contribute by inducing the farmers to leave their dead animals lying around unburied, thus remaining a source of infection until the 'dead-hog man' comes and takes them away. If transportation of swine that have died of the disease is prohibited by law, the numerous rendering tanks will soon disappear, and another source of infection will thus be closed.

The disease is spread not only by the transportation of dead hogs, but also by that of diseased ones. That such is the case becomes apparent by the fact that swine plague in its spreading not only follows the course of streamlets, creeks, and rivers, but also travels along the line of railroads and public highways. All traffic in, and transportation of, diseased hogs and pigs, and of animals that have died of swine plague, should, therefore, be stopped; and sending diseased swine to market — a very common practice at present — should be made a criminal offense. Further, a law which would compel every owner of swine to take care of them, to confine them to his own premises, and not allow them to run at large on public highways, etc., would, if executed and complied with, do a great deal of good, and prevent a great many infections. It has happened very often that a stray hog or pig has carried the disease into a healthy herd; and, *vice versa*, it has happened also — perhaps just as often — that a hog or pig has become infected while among other swine and, coming home again, has introduced swine plague into the herd to which it belonged.

As to a treatment of diseased animals, there can be no doubt that a good hygienic treatment — a strict separation of the diseased animals from each other, so as to prevent any further influx of the infectious principle, is advisable. Swine diseased with the plague evince very often a vitiated appetite for the excrements and the urine of their companions, and as these excretions contain immense numbers of Schizomycetes, spherical and rod-shaped, and are therefore highly infectious, more and more infection or disease-producing elements will be introduced into the animal organism if that vitiated appetite is satisfied. Clean quarters and clean troughs (it is very important to clean the troughs after each meal), clean and fresh well-water to drink, clean food to eat, reasonable and adequate protection against the inclemency of the weather (against heat as well as against cold, rain, snow, etc.), and pure air to breathe, will go a good way and may save many an animal."

Burning the carcasses of hogs that have died of this disease is a safe and easy means of disposing of them. A little kerosene oil poured over the body, and a small amount of fuel, will soon accomplish the cremating process.

Inflammation of the Lungs. See PNEUMONIA.

Inversion of the Vagina and Uterus.—This occasionally occurs with swine, and is generally caused by difficult parturition. Wash the protruding parts carefully in clean, tepid water, then lubricate the hand in sweet oil, or fresh melted lard, and gently return the parts to their natural position. This should be done as carefully as possible, as the parts are very delicate in structure and easily injured. It should also be done as soon as possible after the inversion takes place. After being returned, it will be well to secure a truss of some kind over the part to prevent a recurrence of the same difficulty, which would be very likely to follow if this were not done. A well known veterinary surgeon records the following device in such cases:

"This is best accomplished by using a truss cut out of leather; an old boot top will do in case of emergency. A strap like a surcingle is passed around the body behind the fore-legs,

to which is attached four cords corresponding to four outer holes in the corners of the truss, to keep it in position. The two upper cords pass along either side of the spine, while the two lower ones pass down between the hind legs, and along either side of the belly. When secured in this way for a few days, the operation is generally attended with success, the parts soon returning to their normal condition."

The animal should be separated from the others and kept as quiet as possible for a few days. It would also be a good plan, if possible, to place the patient in a narrow enclosure so that it cannot turn round, and where the hind part of the body will be raised higher than the fore part, which will lessen the tendency of the parts being again inverted.

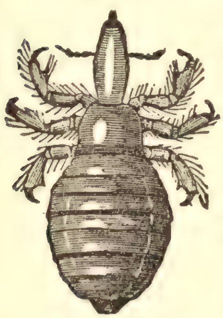
Itch. See MANGE.

Lard Worm, etc.—The internal parasites of hogs are numerous, the most common being those which produce the measles and trichinæ, the lard worm (*Stephanurus dentatus*), and the kidney worm (*Eustrongylus gigas*). The lard worm is from one to three-fourths of an inch long, and about one-thirteenth of an inch broad. It is found in nearly all portions of the body, but more frequently in the liver, the fat about the ribs, heart, and air passages.

STEPHANURUS DENTATUS OR LARD WORM.
a, Male. *d*, Female. *c*, Head, magnified.

The kidney worm is found in the kidneys, upon which it lives until the whole is eaten, when it eats its way through into the intestinal cavity, causing death from nervous prostration and inflammation. This worm is sometimes found in the intestines, and grows from one to three feet in length, and from a quarter to a half inch in diameter. But little can be done by way of treatment for these parasites, and the animal had better be killed at once, to avoid all danger of extending the difficulty to others of the herd.

Lice.—It is much better to avoid these insect pests, and so save the trouble of exterminating them. Sulphur or Scotch snuff, mixed with lard, also tobacco water, are very effectual remedies. A common insect powder, *pyrethrum*, can be obtained of any responsible druggist, and if properly applied, will soon destroy them. Carbolic acid, mixed with three times the quantity of water, is also very effectual.



HAEMATOPINUS. Blood-sucking louse of the pig.

Another very simple remedy is to give the pigs a thorough washing with soft soap and warm water. It must, however, be remembered that the nits will hatch in from twelve to fourteen days, so that whatever be the remedy that is used, there must be a second application, in order to make the success complete. It is found also that if the cause of lice be not removed, all remedies will fail. Old bedding and manure must be all taken away, and the floors of the pens and feeding troughs must be thoroughly scalded with hot water, and the walls, fences, posts, and other objects against which the hogs lean or rub themselves should have one or two coats of whitewash, or be washed with crude petroleum, or kerosene oil.

Once in five or six weeks, during hot weather, it would be well to go over the entire pen with a mixture of kerosene in hot water, using an old whitewash brush for the walls, and a broom for sprinkling the floors well. Prevention is, however, much the easiest and best, and if the rules that govern health are observed, there will be no danger of trouble with skin parasites of any kind.

Malignant Epizootic Catarrh.—This disease is generally brought on by a severe cold, although it is frequently generated and developed with great rapidity by filthy and ill-ventilated pens. The symptoms are a feverish condition, difficulty in breathing, panting, and hoarse cough. The head will droop, there will be a constipated condition of the bowels

usually, but sometimes an unnatural looseness. The animal seems weak, and walks with a stiff, tottering gait. It sometimes proves fatal in three or four days, but if the animal recovers, the duration of the disease will be about two weeks. If the animal be opened after death, the nasal passages of the upper part of the throat, the windpipe, and lungs will be found to be greatly inflamed, while frequently the spleen will be enlarged, soft, and of a dark color; the liver is also frequently affected. Separate the patient from all other animals, and give him a clean, well-ventilated pen. If the bowels are constipated, give one and a half ounces of castor oil mixed with a pint of milk; if there be a diarrhœa, give twenty grains of podophyllin, and two drachms of bi-carbonate of soda, mixed with the same quantity of milk. Apply to the chest and throat mustard and vinegar well rubbed in, or, if a blister seems necessary, a blistering ointment may be used instead, consisting of one ounce of cantharides and four ounces of olive oil. Give good nursing for a few days, and if the animal does not improve, we would advise killing it and burying it deep, where no other animal can come in contact with the carcass, and thoroughly disinfect the pen before putting other pigs into it.

Malignant Sore Throat.—The symptoms of this disease are similar to those of the above-mentioned malady. The animal seems dull and stupid, is disinclined to move about; will not eat; coughs and makes repeated efforts to vomit; the bowels are at first constipated, followed in the second stage of the disease with a fetid diarrhœa, and difficulty in urination. There is a difficulty in swallowing; red and purple spots appear around the throat, ears, heart, and between the forelegs. The throat and tongue will sometimes be so swollen that the latter will protrude from the mouth, and the animal will die of suffocation in a short time after the attack. Give two ounces of castor oil as soon as practicable in a pint of milk. Foment the neck and chest with hot water saturated with copperas; after which apply turpentine and sweet oil mixed in equal parts. After the castor oil has taken effect, give two or three times a day the following: 20 grains nitrate of soda, and the same quantity of nitrate of potash, mixed with a little milk or gruel.

Mange.—This is a troublesome disease of the skin, due to an insect (*Sarcoptes suis*), a species of acari, which produces a constant irritation or itching, accompanied with small eruptions of the skin on the surface of the body generally. It is similar to the itch in man, and is exceedingly contagious, never originating spontaneously, and requires that either the living parasites or their eggs shall pass from diseased to healthy animals. Like the scab in sheep, it is communicated by contact with anything that has been contaminated by the diseased animal, such as rubbing posts, sides of the pen, bedding, etc. A prominent veterinarian says:

"A most important point, very clearly established, is, that although any animal may accidentally be the carrier of contagion between other two—such as a cat or dog carrying disease from one horse to another—that it is essential for the development of a real mange on any animal that the insect should be proper to that animal. Thus men engaged around mangy horses, carry the malady from one animal to another, and suffer very slightly and only for a short time themselves. The parasite which lives on the horse does not live on man, and the parasite which lives on the sheep does not contaminate the shepherd's dog, though the latter may, like the shepherd, or the many rubbing places, pens, railroad trucks, etc., be the means whereby the malady spreads. It appears, however, that animals of the same genus, though of different species, may be attacked by precisely the same insect; thus, for instance, the cat, the lion, the tiger, and other feline animals, have one kind of insect common to all. The pig is perhaps less affected by this troublesome disorder than other animals; anyway it is the least observed."

Considerable itching and uneasiness accompanies this disease, the animal frequently rub-

bing itself, and does not seem to thrive well. An examination with a sufficiently powerful magnifying glass will show these minute parasites under the scales of the cuticle.

Give the animal daily for a week or ten days $\frac{1}{2}$ to $\frac{2}{3}$ of an ounce of sulphur mixed with the food. Rub the animal thoroughly with soft soap, allowing it to remain on for three or four hours, after which wash off in warm water. When dry, apply an ointment of sulphur and lard in which a little petroleum is mixed. Rub this in thoroughly and let it remain three or four days; then wash again thoroughly with soft soap and water as before. If this does not remove the difficulty, repeat the application of the ointment as before. It will do no good to treat this disease unless the animal be removed to perfectly clean quarters, with clean bedding, etc. The old bedding should be burned and the pen thoroughly disinfected before using it again. This may be done by first cleaning out all the refuse and burying or burning it, and fumigating by closing all the doors and windows of the pen as tightly as possible, and burning sulphur for fifteen or twenty minutes, so that the smoke will penetrate every part; after which wash the walls and floor with petroleum, or apply a coating of whitewash.

Measles.—Measles in swine results from entozoa, or small internal parasites, which are embryo forms of the common tape-worm, being caused by eating the egg of the common tape-worm of man (*Tænia solium*). Measly pork is unfit for human food, and if eaten without being most thoroughly cooked will be sure to cause tape-worms, as the eating of trichina-infected pork will cause trichina. It is a well-known fact that dogs are subject to tape-worms, probably from eating raw flesh, hence they void the eggs of this parasite, and if swine come in contact with their excrement, they will be liable to become infected. In-and-in breeding, impure food, especially allowing swine to eat or root over the excrement of other animals, are the fruitful causes of this disease. No human excrement should ever be used for manuring swine pastures, or the land where roots are grown for pigs, especially when they are to be fed raw.

Contact with others of the herd having this disease should also be avoided. Too much caution cannot be used against breeding from pigs that have ever been affected with this disease, or permitting breeding sows to eat the droppings of other animals, or their own. Raw flesh, such as the refuse from the slaughter-house, should never be fed to pigs, as it may contain the embryo tape-worms, and will be liable to produce measles in the pigs that eat it, as in their progeny. The tape-worm is a flat-bodied worm closely jointed, the entire body being made up of small segments or joints from an eighth to half an inch in length, joined so as to make a depression between the segments. These worms sometimes attain the length of a hundred feet or more. The head is at the narrow end, and is globular in form, having circular sucking-discs, and a proboscis encircled by a row of small hooks by which it can attach itself to the inner coat of the stomach or intestines.

From the broad end of the body, the segments become detached or unjointed as it were, from time to time as they mature, and are expelled from the body of the animal. These small segments may frequently be seen wriggling along over the ground, grass, and vegetables where they chance to be deposited, and as they go leave an innumerable number of small eggs, which are taken up by grazing animals, more especially hogs. It is estimated by those who have given the subject a close investigation, that a single tape-worm lays upwards of 25,000,000 of eggs.

When one of these eggs is taken into the stomach of a hog, it hatches into a six-hooked embryo, which bores its way into the tissues, and there it encysts itself and remains a long time. A person eating flesh having such embryos will take into the stomach what will soon produce a tape-worm, which will cause intestinal pain, emaciation, nervousness, and sometimes convulsions and death.

Symptoms, etc.—On the skin of pigs affected with this disease will be found a number of small watery pimples or pustules of a reddish color; the animal coughs; is feverish,

and has a weakness of the hind legs, together with other indications of general debility. Sometimes there are pustules under the tongue and a discharge from the nose and eyes. Measly pork may readily be known by the cysts distributed through the muscular and other tissues of the body, some of which are about the size of a grain of wheat. The disease seldom proves fatal, still it is regarded generally as incurable in swine. It is more easily prevented than cured.

If, however, taken in the early stages, daily small doses of sulphur, saltpetre, or Epsom salts be given for two or three weeks, with a liberal supply of wholesome, nutritious, and easily digested food, the eggs might be passed from the stomach and bowels, but this is not certain. If possible, keep the animals from access to means of becoming infected with the disease, such as the excrement of human beings and dogs.

Pneumonia.—This is occasioned by a severe cold. The symptoms are a feverish state of the system, shivering of the body and limbs, quick, labored breathing, attended with more or less coughing and loss of appetite. Keep the bowels from being constipated by giving mild doses of Epsom salts, or castor oil, if necessary. Put the patient in a comfortable, clean, and well ventilated pen, and give good nourishing food, and all the pure water he will drink. Rub the chest and side frequently with a mixture of ground mustard and vinegar. Good nursing will generally affect a cure, sooner than medicines.

Protrusion of Rectum (*Prolapsus Ani*).—This is of not unfrequent occurrence in swine, especially among young pigs, and generally results from eating too much food of a constipating tendency, and from a lack of a variety of food. It also sometimes follows diarrhœa and difficult parturition. If the part protruded is not too badly swollen, and is red in color, it may be carefully washed in tepid water; after which, lubricate the hand with sweet oil, and gently crowd it back to its place. This must be done with great care. It may be well to apply a little laudanum or extract of witch hazel before returning the part. This should be followed by having the pig stand in a place where he cannot turn around, and where the hind legs will be elevated several inches higher than the fore legs. When the parts have turned quite black, and show signs of mortification setting in, it will be well to send for a skillful veterinary surgeon; and if necessary the offensive portion can be removed; but this will require a skillful use of the knife, and should not be done carelessly.

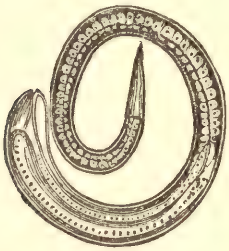
Quinsy or Inflammation of the Tonsils.—This is an inflammation of the glands of the throat, and is quite common with swine and sometimes fatal, as a hog is more easily suffocated by a swelling of the neck or throat than any other animal, especially if rather fat. The symptoms are denoted by a difficulty in swallowing, a swelling of the throat, and especially under the lower jaw and neck. The swelling is frequently so great as to cause the tongue to protrude from the mouth. The first thing to be done is to scarify the swollen parts with a thin sharp knife until blood issues freely; this will have a tendency to reduce the inflammation. Afterwards foment the parts with cloths wrung out in hot water, keeping them constantly applied to keep up a slight bleeding, and reduce the inflammation.

Give an injection of warm water with half an ounce of castor oil. Dissolve a teaspoonful of chloride of potassium in a tablespoonful of warm water and turn it down the throat of the patient, three or four times a day. The following is also a good remedy: two teaspoonfuls of spirits of turpentine mixed with the same quantity of melted lard. This may be given in a half-pint of gruel or milk, if the animal will eat; if not, swab the tonsils frequently with it, using a small stick with a sponge or cloth fastened around the end. Give the animal all the cold water it will drink, with a little vinegar and nitre mixed with it.

Rheumatism.—This is not uncommon with hogs, and results almost invariably from exposure to cold storms, sleeping in damp, filthy, ill-ventilated pens, or on the cold ground. To prevent the evil, provide warm, clean beds, with protection from dampness. For pigs

affected with rheumatism, Mr. Coburn recommends in treatment a tablespoonful of cod-liver oil once or twice a day, mixed with their food, which should be of a soft and nourishing character.

Trichina.—The disease known in the human family by this name is caused by a small parasite, which is generally found in the muscles of voluntary motion. This parasite is found in the muscles of all animals, but is most common in those of the human species, the hog, and rat. Trichinae are very small, varying from one-eighteenth to one-sixth of an inch in length. When encysted in the muscles, the cysts are slightly oval, as will be seen by the



ADULT INTESTINAL TRICHINA SPIRALIS. MAGNIFIED.

MUSCLE TRICHINA ENCYSTED. MAGNIFIED.

accompanying cut of a magnified one, taken from the muscles of a hog. The mature and fertile worm lives in the intestines of the animal and there lays its eggs.

As soon as the eggs hatch, the young trichinae at once migrate by eating their way through the intestines, and find their way into the voluntary muscles, and in course of five or six weeks from the time of hatching, they become encysted in the muscles, and will do no farther injury to the man or animal containing them, but during the five or six weeks in which they are migrating to the muscles, the great danger lies, as this is attended with pain, exhaustion, and emaciation, which frequently results fatally. When meat containing the encysted trichinae is taken into the stomach, it develops into a mature parasite which lays its eggs in the intestines, which soon hatch.

The symptoms are frequently mistaken for rheumatism, the muscles affected becoming swollen, sore, and painful, being attended with emaciation and exhaustion. Animals affected with trichinae seem dull, and disinclined to move about; there is a loss of appetite, and a soreness and stiffness of the body generally, especially the hind parts.

If they live through the sixth week of the disease they will recover, but their flesh should never be used for food.

Prevention is about all that can be done, as treatment is of little avail. It usually happens that not until cutting up the meat and having it closely examined, that the disease is noticed. Hogs should never be fed on the offal from slaughter houses, or raw meat of any kind, and their pens should be kept free from rats and mice. Hogs should also never be permitted to have access to the excrement of human beings or dogs, as it may contain the eggs or embryos of the parasite. Pork should never be eaten that has not been well cooked, for trichinae will survive a temperature of 140°.

Worms.—When pigs have the usual appetite for food, and, although well fed, have an unthrifty appearance, it may well be suspected that something is wrong. A convincing proof that worms may be the cause of the difficulty may occasionally be had in such cases by finding them in the excrement. For diet, give a plenty of sour food, such as sour milk, sour fruit, also raw onions, acorns, potatoes, turnips, etc., and let them have access to charcoal and ashes, avoiding impure water from stagnant pools or other sources, at all times. Give

every other day for a week or two a tablespoonful of sulphur with the food, to be followed each alternate day with from fifteen to thirty drops of turpentine, regulating the dose according to the size and age of the pig.

Use of Disinfectants.—Barns, stables, sheds, hog houses, and in fact outhouses of every kind on the farm, may at times require the use of disinfectants, and especially those that have been occupied by animals sick with any contagious disease. One of the easiest and best methods of fumigating a building is to close all openings through which the smoke could escape, and burn sulphur and wood tar in the proportion of one pound of sulphur to two of the tar. Mix them with tow, and allow the smoke to become sufficiently dense to penetrate to every part of the building. It is also a good plan to fumigate stables a little two or three times a week, where animals are sick, but not sufficient to make them cough. The walls, floors, and every part of the building should be washed with diluted carbolic acid, and the blankets, etc., be wet with it. If the pure carbolic acid is used for this purpose, one pint of the acid will be sufficient for twelve gallons of soft water, or in the proportion of about one part carbolic acid to 100 parts of water. The impure carbolic acid obtained at gas works may be used without being diluted. Chloride of zinc in the proportion of one ounce to a gallon of water, should be sprinkled over the droppings of the stables or pens. All sick animals should be apart by themselves, and those having care of them should never approach or handle the well ones. Carbolic acid is not only a good disinfectant, but is useful in destroying the infectious principle in many respects. If, for instance, the food or water for drinking has become contaminated, carbolic acid may be given in ten drop doses each morning and evening, to a hog weighing 150 lbs., it being mixed with their liquid food. During the prevalence of contagious diseases, scratches and wounds should be treated with diluted carbolic acid, and in castrating any animals, the hands should first be washed in it.

Dry earth, lime, charcoal, and tar are among the disinfectants commonly used in pens and stables. Dry earth absorbs the liquids and destroys the odors of excrement, and also prevents unwholesome emanations. Lime is also excellent for this purpose, while charcoal is a powerful absorbant of gases. Common wood tar contains these properties in a less degree than those already mentioned, while chloride of lime is perhaps one of the best for all common practical purposes.

BREEDS AND THE PRINCIPLES OF BREEDING.

THE important relation that good farm stock holds to advanced agriculture is becoming daily more clearly recognized and appreciated by farmers generally; but how to produce animals that shall possess the desirable characteristics and qualities is not commonly understood, or demonstrated in practical results. To search out the rules which govern the results desired to be obtained, and to apply them in systematic practice, has been the work of eminent breeders of the past and present age, who have devoted much time, labor, and attention in determining these laws and applying them, until breeding has become an art, which has been carried to such a state of perfection that the breeder might almost be said to possess the creative art,—the power to determine beforehand the type of animal that will be produced; for instance, we have the horse intended for speed, for draft, for the saddle, and for the carriage; cattle designed for beef exclusively, or for beef and dairy products combined; the cow designed especially for milk production and cheese, and those designed particularly for the production of butter; sheep that will produce the long combing wool, that of a medium staple, and a short staple; sheep, the principal characteristic of which is wool production, or those characterized for the production of wool and mutton combined; swine that will yield a superabundance of fat, or those that will furnish the best quality of lean pork, suited for hams and bacon; poultry, the chief excellence of which is egg production, or in furnishing the best quality of table fowl; dogs that will render the farmer and herder most valuable service in the care of sheep and cattle, and those designed more particularly for assisting the sportsman, etc., all of which are proofs of the skill of the herder in establishing breeds for special purposes, by making use of the material at hand, in a judicious selection and combination based upon a knowledge of hereditary law, or what might more properly be termed the law of nature. Breeding in agriculture, is therefore the art of so selecting and coupling animals as to produce those best fitted for the purpose for which they are intended, and this art seems to apply uniformly to the breeding of all domestic animals.

It is only within the last two hundred years that careful and systematic breeding has been practiced in the rearing of cattle, while during the last fifty years more has been accomplished in the improvement of farm animals by judicious breeding than during all the time preceding in the history of agriculture. But little had been accomplished in a systematic way towards the improvement of British cattle until Bakewell undertook the improvement of the Long Horns. Subsequent to this the Collings improved the Durhams, sometimes called the Teeswaters, and hence we have the noted Short Horns of to-day, while later breeders developed the Devons, Herefords, etc. The fact is fully established in the historic records of the past that wherever agriculture has attained any advancement with a people, the domestic animals have always improved accordingly.

Nature works according to fixed rules, which are commonly termed natural laws. There may be certain exceptions to these rules, since difference in conditions will tend to difference in results; yet still there will be seen through all, a connected chain of evidence, showing the existence of well established laws.

How Breeds are Formed.—The term breeds is usually applied to the varieties of domestic animals. A breed is consequently a variety, and implies the existence of a group of individuals distinguished from others of their congeners by the possession of certain peculiar characteristics which are transmitted to their offspring; and it is this transmission of peculiarities which is the essential characteristic of a breed. The art of breeding may properly be said to consist in changing the conditions of life, and of regulating the reproduction

of animals and plants. The commonly recognized law of heredity is, that "like produces like," and this must hold true to a great extent, or the existence of breeds would be an impossibility; but if it were *absolutely* true, or it were an arbitrary rule which nature strictly enforced in every particular, it is evident that neither by man's interference nor the operations of nature could a new breed or race be produced, since the offspring would in all cases be identical with the parents. It seems, therefore, that owing to the exceptions to this general rule or law of nature, which renders it possible for difference in conditions and circumstances to produce different results, new breeds have arisen.

In plants, a new variety of species is produced by crossing one variety on another. In crossing two different species of a genus, a hybrid is produced, the fertility of which is generally destroyed, hence the hybrid rarely perpetuates its kind. Prof. D. C. Eaton, of Yale College, says respecting hybrids:

"It may therefore be said of hybrids generally, that they are either sterile, or, if fertile, that they will most frequently return, after a few generations, to their parent forms.

Hybrids can be produced only between nearly related forms. So true is this law believed to be, that Darwin seems to suspect the inaccuracy of any zoölogical classification which places in different genera animals between which hybridity is possible. Every story of a monster, half one thing and half something utterly different, no matter how high the authority for the story, is necessarily and absolutely false, and such fabled creatures must be relegated to the category of the minotaur, the centaur, and that product of the Mississippi valley, which is said to be 'half alligator and half horse.' Dogs cross freely with wolves and jackals, because these are all very closely related, but between dogs and all animals other than *canidæ*, or dog-like creatures, there is no possibility of hybridism.

So also in the vegetable kingdom: there is no hybridizing of unrelated plants. The apple and the wild American crab-apple have been hybridized, and I believe, with the result of producing a valuable fruit; but any attempt to hybridize the apple and the peach, or the plum and the pomegranate would be utterly vain. Various kinds of grapes have been hybridized with most valuable results. Very many kinds of cultivated strawberries are the outcome of successful hybridizing, and it is probable that a good many of our fruits have in them the strains of more than one original species. But it should be remembered that these kinds of grapes, strawberries, plums, gooseberries, etc., are not permanent *varieties*, using the word in its proper sense; they are only hybrid or mongrel productions, with individual peculiarities, but multiplied by division of the root stocks, by runners, by grafting, by budding, by slips. None of them could be depended on to reproduce itself by seed, and if the seed should grow at all, which is not always certain, the offspring would in all probability show strong tendencies to revert to one or both of the original parent forms."

When two animals or plants of the same species are crossed, but differing one from the other, the product will be fertile, though not in so great a degree as in those of a like kind.

In such cases the offspring will resemble one parent more strongly than another, and these varieties will be very liable to reappear in after generations. This reversion to remote ancestry, commonly termed atavism, is seen in many breeds, notwithstanding the care taken in breeding, and the many years passed after the particular cross was made.

Prof. W. H. Brewer, of Yale College, says in regard to forming new varieties of plants, "Suppose that suddenly, by a miracle, every kind of cultivated apples in the world were swept out of existence, and we were left with only the original wild stock to begin anew with, but had all our present knowledge bearing on the question of again recovering the lost treasure. How should we go to work; what methods and means has science and art to suggest, whereby to transmute that small, sour, acrid, puckery crab-apple into the luscious and various kinds of apples we had lost, and change the crabbed, thorny shrub of the hedges into the comely, thornless tree of the orchards?

This would be the course: We would plant a large number of seeds in various soils and under varied conditions, choosing the seeds from promising and thrifty plants. When the trees were grown and produced their fruit, we would choose for the second planting the seeds of such fruits as deviated most widely from the parent, both for better and for worse. The next generation the same—again choose the most diverse forms for seed; choose the fruit differing as widely as possible from the parent, from each other, and from the ancestral stock. The variations for some generations might be slight, but there would be *some* variation. I have already said that the law of heredity tends to make offspring *like* the parent, but we choose offspring as *unlike the parent as possible*, for a few generations, and thus the force of heredity in *any one direction* is lessened, until at last we would have the tendency to sport so enhanced that the forms produced would be very numerous. Then we would select those best for our use, and propagate them by slips, grafts, buds, or cuttings.

The two noted horticulturists, Vilmorin, father and son, for more than half a century carried on a series of experiments on this method of breaking up the direction of heredity, and making varieties. When the father died the son continued the work which the elder had begun and the two for a time pursued together. He published the results some twenty-five years ago, and all the more recent and rapid advance in our knowledge of the laws and phases of vegetable growth only confirm their conclusions. Gardeners all agree that in bringing a wild species into cultivation, it usually, at first, for some generations, shows but slight disposition to change or sport; that after a time sporting begins, and then it rapidly increases. Instances of this among ornamental plants, like the dahlia, chrysanthemum, etc., are too numerous and well-known among gardeners to need more reference here.

With some Old-World fruits the process has gone on so long, and so many influences have been at work, that now it is *the rule* that the fruit of the seedling *should be unlike* the parent, and all the various and choice varieties of apples we now have are the selections of countless thousands of varieties which have arisen in the various lands where apples have been grown, and during the long ages apples have been cultivated. Time has been an essential factor in this work; for ages the number of varieties were few compared with what we now know; we are now reaping the rich harvest which our race has been sowing all these many centuries."

The difficulties in forming a new breed will hence be seen, as these varieties will sometimes suddenly appear after breeding true for several generations. It is not advisable to attempt to form a new breed out of incongruous materials that may happen to be at hand, for it would be sure to result in failure. It will be far better to select from breeds already formed, according to the use for which they were intended, than to attempt to establish a new one, that perhaps after fifty or a hundred years will be no better, if as good, as some breeds we now have, that are the result of many generations of careful breeding. In establishing a breed the main principle which breeders have adhered to, is to always select the best individuals in each generation for breeding purposes. In the art of breeding there are recognized three principles or laws, viz.: heredity, variability, and selection; the first two relate to the qualities of the animals which render the art practicable, and the last to the art of man. Whatever the breed or its characteristics, good feeding, good shelter, and judicious management generally, combined with careful selection, will do much towards maintaining and perfecting the desirable qualities. Lack of proper care and injudicious selection will soon destroy the effects of previous good management and careful breeding. "Bad feeding will soon mar good breeding," is an old maxim that should be more generally understood by farmers, and their practice modified accordingly. No matter how good the animal may be, in itself, or how carefully its ancestors have been bred for previous generations, the pedigree will soon be of little avail, if it is stunted in growth by being kept in a half-starved condition, and permitted to shift for itself generally. Good feeding should always be combined with good breeding in order to attain the best results.

Atavism.—Webster defines atavism as denoting "the recurrence of any peculiarity or disease of an ancestor in a subsequent generation, after an intermission for a generation or two." Dana defines it "the recurrence of the original type of a species in the progeny of its varieties." This occasional reversion, or "cropping out" of the peculiarities or types, is frequently seen in perpetuating the races of animals and plants, and may properly be said to be due to the power of hereditary law, by which characteristics are transmitted from one generation to another. Thus we occasionally see horns in the Galloway, Suffolk, and other breeds that have been bred hornless for many generations, but which were originally a horned race of cattle. Sidney cites a remarkable case of atavism in a litter of Essex pigs, two of which showed the Berkshire cross of twenty-eight years previous. Numerous instances of the kind might be mentioned, showing that in animals and plants there is a constant tendency in nature to revert to the original type, and this is what the breeder has to constantly guard against, by always selecting those types of the breed for perpetuating the race that possess the qualities it is desired to have transmitted; in other words, always select *the best* for breeding purposes.

Heredity.—The power of animals to propagate their own characteristics is hereditary, or transmitted from one generation to another. It is one of the principles of breeding that the strongest and best-bred animals will have the predominating influence over the offspring. The more powerful this inheritance, and the stronger the in-breeding,—avoiding incest,—the more surely will these characteristics be transmitted to the progeny; or, in other words, the purer and less mixed the breed, the more likely it is to be transmitted unaltered to the offspring.

Darwin says: "It is hardly possible, within a moderate compass, to impress on those who have not attended to the subject the full conviction of the force of inheritance, which is slowly acquired by rearing animals, by studying various treatises which have been published on the various domestic animals, and by conversing with breeders." He refers to certain peculiarities that have appeared but once or twice in the world's history, but which have reappeared in children or grandchildren of the individuals so characterized; as for instance, Lambert, known as "the porcupine man," whose skin was covered with warty projections which were periodically moulted, had all of his six children and two grandsons affected in a similar manner. Other striking instances of inheritance in man might be mentioned, and which are everywhere apparent, such as peculiarities of form, feature, temperament, and even disease, for injurious peculiarities may be inherited quite as readily as those that are beneficial.

Nearly all the diseases to which the horse is subject are hereditary, such as contracted feet, curbs, splints, spavin, founder, weakness in the fore legs, roaring, specific ophthalmia, blindness, crib-biting, etc. The very existence of the numerous breeds of domestic animals is convincing proof of the possibility of the transmission of characteristics of every kind, instance of which has been given in the varieties of domestic pigeons, which amount to over one hundred and fifty, all differing from each other, and yet breeding true to their kind. It is well known that a race of cattle was formed in Yorkshire many years ago, called "Dutch buttocked" cattle, which were characterized by having very large hind quarters. This race was formed by selecting for breeding purposes in each generation the animals having the largest hind quarters. This peculiarity became so marked when the herd began to be established, that the large size of the hind quarters of the calves were found to greatly increase the dangers of parturition. A rabbit born with only one ear became the founder of a breed which steadily produced one-eared rabbits.

Animals that have been mutilated have been known to transmit these peculiarities to their offspring, as for instance, guinea pigs that had lost their toes have in several instances produced offspring without toes. Dr. Miles, in his work on Stock Breeding, has collected

numerous instances of acquired and abnormal characteristics and illustrations of heredity, some of which we insert, since they serve to illustrate this power in animals so forcibly. The tendency to lay on fat rapidly, and to mature early is inherited in the best families of Shorthorns, Devons, Herefords, and other meat-producing breeds, while the ability to secrete an abundant supply of milk is in like manner perpetuated in the Ayrshires, the Jerseys, and other dairy breeds.

The certainty with which these acquired qualities are transmitted constitutes one of the most valuable peculiarities of a breed. The American trotting-horse furnishes another illustration of the inheritance of acquired characters. The various breeds of dogs have peculiarities that have been developed by a long course of training, which are transmitted with a uniformity that is surprising. Young setters, pointers, and retrievers, that have never been in the field, will often "work" with as much steadiness and ability as those that have had a long experience in sporting. In such cases, however, it will be found that the ancestors, immediate or remote, have been well trained in their special methods of hunting. The Shepherd dog is remarkable for its sagacity and the persistence with which it carries out the wishes of its master; and it would be difficult, if not impossible, to train dogs of any other breed to equal them in their special duties. The Greyhound runs by sight, and the Bloodhound by scent, and their offspring all inherit the same peculiarities. The curious fact was observed by Mr. Knight, that the young of a breed of Springing Spaniels which had been trained for several successive generations to find woodcocks, seemed to know as well as the old dogs what degree of frost would drive the birds to seek their food in unfrozen springs and rills.

A new instinct or peculiar characteristic has also become hereditary in a mongrel race of dogs employed by the inhabitants of the banks of the Magdalena almost exclusively in hunting the White-lipped Peccary. The address of these dogs consists in restraining their ardor and attaching themselves to no individual in particular, but keeping the whole in check. Now, among these dogs some are found which, the very first time they are taken to the woods, are acquainted with this mode of attack, whereas a dog of another breed starts forward at once, is surrounded by the peccaries, and, whatever may be his strength, is destroyed in a moment. A race of dogs employed for hunting deer in the plateau of Santa Fé, in Mexico, is distinguished by the peculiar mode in which they attack their game. This consists in seizing the animal by the belly and overturning it by a sudden effort, taking advantage of the moment when the body of the deer rests only upon the forelegs, the weight of the animal thus thrown being often six times that of its antagonist. Now, the dog of pure breed inherits a disposition to this kind of chase, and never attacks a deer from before while running; and even should the deer, not perceiving him, come directly upon him, the dog steps aside, and makes his assault upon the flank.

On the other hand, European dogs, though of superior strength and general sagacity, are destitute of this instinct, and, for want of similar precautions, they are often killed by the deer on the spot, the cervical vertebræ being dislocated by the violence of the shock. Mr. Lewes had a puppy taken from its mother at six weeks who, although never taught to "beg" (an accomplishment his mother had been taught), spontaneously took to begging for everything he wanted; when about seven or eight months old, he would beg for food, beg to be let out of the room, and one day was found opposite a rabbit-hutch apparently begging the rabbits to come out and play. A dog, owned by myself several years ago, inherited the same accomplishment from his mother, who had been trained to sit in an erect position and hold a stick in imitation of a soldier with a musket. This dog was taken from his mother when but a few days old, and before it had an opportunity of learning any tricks by imitation. Without any training, when a few months old, he assumed the erect position whenever anything was wanted, and, if that did not attract attention, he would "speak" with a short bark, as his mother had been in the habit of doing.

Dr. H. B. Shank, of Lansing, informs me that a cat owned by him had learned to open doors that were secured with a latch, and all of her descendants inherited the same peculiarity; while another family of cats, brought up with them, did not learn the trick, although they had sufficient intelligence to ask the assistance of their more expert friends when they wanted a door opened. Girou de Buzarringues reports the frequently-quoted case of a man who had the habit, when in bed, of lying on his back and crossing the right leg over the left. One of his daughters had the same habit from birth, and constantly assumed that position when in the cradle. Darwin reports the interesting case of a boy who had the singular habit, when pleased, of rapidly moving his fingers parallel to each other, and, when much excited, of raising both hands, with the fingers still moving, to the sides of his face on a level with his eyes; this boy, when almost an old man, could hardly resist this trick when much pleased, but, from its absurdity, concealed it. He had eight children. Of these, a girl, when pleased, at the age of four and a half years moved her fingers exactly in the same way, and, what is still more odd, when much excited, she raised both her hands, with her fingers still moving, to the sides of her face, in exactly the same manner her father had done, and sometimes still continued to do when alone.

The handwriting of members of the same family is said to frequently present a marked resemblance; and it has been asserted that English boys, when taught to write in France, naturally cling to their English manner of writing. There are families in which the special use of the left hand is hereditary. Girou mentions a family in which the father, the children, and most of the grandchildren, were left-handed. One of the latter betrayed its left-handedness from earliest infancy, nor could it be broken of the habit, though the left hand was bound and swathed.

Wild animals, living on islands not often visited by man, do not fear him, but allow the closest approach without hesitation. When the Falkland Islands were first visited by man, the large, wolf-like dog (*Canis Antarcticus*) fearlessly came to meet Byron's sailors, who, mistaking this ignorant curiosity for ferocity, ran into the water to avoid them. Even recently, a man, by holding a piece of meat in one hand and a knife in the other, could sometimes stick them at night. On an island in the sea of Aral, when first discovered by Butakoff, the Saigak Antelopes, generally very timid and watchful, did not fly, but, on the contrary, looked at the visitors with a sort of curiosity. So, again, on the shores of the Mauritius, the Manatee was not, at first, in the least afraid of man, and thus it has been in several quarters of the world with seals and the morse. Quadrupeds, and also birds which have seldom been disturbed by man, dread him no more than do our English birds, or the cows or horses, grazing in the fields.

Dr. Kidder, in his description of the "Sheath-bill" (*Chionis minor*), on Kerguelen Island, says: When I sat down upon a rock and kept perfectly still for a few moments, they crowded around me like a mob of street boys around an organ-grinder, and all seemed perfectly fearless and trustful. That the descendants of such animals, inheriting the accumulated experience of their ancestors, become wild, is shown in the instinctive dread of man exhibited by the young of the same and allied species that are frequently brought into contact with him. G. Leroy observes, that in districts where a sharp war is waged against the fox, the cubs, on first coming out of their earths, and before they can have acquired any experience, are more cautious, crafty, and suspicious, than are the old foxes in places where no attempt is made to trap them. Knight, who for sixty years devoted himself to systematic observation of this class of facts, says that during that time the habits of the English woodcock underwent great changes, and that its fear of man was considerably increased by its transmission through several generations. The same author discovered similar changes of habit, even in bees.

The marked heredity of habits has led some modern writers to claim that the instincts

of animals are but the experiences of past generations, that are accumulated and established through inheritance. Many of the most valuable characteristics of the various improved breeds of animals have been produced by the inheritance of habits of the system, arising from the conditions and treatment to which they have been subjected. The remarkable records recently made by the American trotting-horse are the result of training and inheritance. The dairy breeds of cattle inherit a marked functional activity of the lacteal glands, which is but a modified habit of the system. Pritchard, in his Natural History of Man, states that the peculiar ambling pace to which the horses bred on the table-lands of the Cordilleras are trained has, by inheritance, resulted in a race in which the ambling pace is natural and requires no teaching. The Norwegian ponies, descended from animals that have been in the habit of obeying the voice of their riders and not the bridle, are said to inherit the same peculiarity, so that it is difficult to break them to drive in the ordinary way.

The habit of migration at particular seasons of the year is inherited, and I have often observed it in Mallard Ducks bred for several generations in a state of domestication. It must be admitted, however, that acquired habits are not in all cases hereditary, but it would be difficult, perhaps, in the present state of our knowledge of the subject, to fix a limit to their inheritance, so far, at least, as a predisposition is concerned. Acquired habits and the original traits of animals appear to be conflicting elements in their constitution, either one of which may, from its intensity, predominate in hereditary transmission. Pigs have been taught to point game and to perform various tricks, but, in the hereditary transmission of their characters, nature has had a stronger influence than culture possibly could have done.

Carpenter, in discussing the heredity of acquired habits, says: There seems to be reason to believe that such hereditary transmission is limited to acquired peculiarities which are simply modifications of the natural constitution of the race, and would not extend to such as may be altogether foreign to it. From a practical point of view, however, the inheritance of acquired characters, so far as they are of any value, is, fortunately, without any apparent limit. Abnormal characters are frequently hereditary, but they are not so likely to be transmitted as acquired habits that are in harmony with the original peculiarities of the animal.

The following examples will sufficiently illustrate this form of inheritance: Gracio Kelleia, the Maltese, was born with six fingers upon each hand, and a like number of toes to each of his feet. He married when he was twenty-two years of age. The result of that marriage was four children; the first, Salvator, had six fingers and toes like his father; the second was George, who had five fingers and five toes, but one of them was deformed, showing a tendency to variation; the third was Andre—he had five fingers and five toes, quite perfect; the fourth was a girl, Marie—she had five fingers and five toes, but her thumbs were deformed, showing a tendency toward the sixth. These children grew up, and, when they came to adult years, they all married, and of course it happened that they all married five-fingered and five-toed persons. Now let us see what was the result. Salvator had four children—they were two boys, a girl, and another boy—the first two boys and the girl were six-fingered and six-toed like their grandfather; the third boy had only five fingers and toes. George had only four children; there were two girls with six fingers and six toes; there was one girl with six fingers and five toes on the right side, and five fingers and five toes on the left side, so that she was half-and-half. The last, a boy, had five fingers and five toes. The third, Andre, you will recollect, was perfectly well formed, and he had many children whose hands and feet were all regularly developed. Marie, the last, who of course married a man who had only five fingers, had four children; the first, a boy, was born with six toes, but the other three were normal.

The fifth toe of Dorking fowls, which is one of the characteristics of the breed, has been inherited, it is claimed, from a five-toed variety introduced into Britain by the Romans.

Whether this is true or not, it is now impossible to determine, but the constancy of this peculiarity, even in the produce of other breeds crossed with the Dorking, would seem to indicate that it is a character which has been fixed by long-continued inheritance. In the Houdan fowls, when first introduced into England from France, a fifth toe was rarely seen· but at the present time it is nearly as constant in this breed as in the Dorkings.

Herbert Spencer very justly remarks, in connection with the monetary aspect of breeding: "Excluding those inductions that have been so fully verified as to rank with exact science, there are no inductions so trustworthy as those which have undergone the mercantile test. When we have thousands of men whose profit or loss depends on the truth of the inference they draw from simple and perpetually repeated observations; and when we find that the inference arrived at and handed down from generation to generation of those deeply-interested observers has become an unshakable conviction, we may accept it without hesitation. In breeders of animals we have such a class, led by such experiences and entertaining such a conviction,—the conviction that minor peculiarities are inherited, as well as major peculiarities."

A difference in conditions will frequently lead to different results, as is instanced by the physical changes brought about in animals by a change of food, climate, etc. It is stated by good English authority that none of the English breeds of sheep can be kept absolutely pure in France, the lambs of even the first generation losing vigor as the heat of summer comes on, and the breed soon becomes degenerate. Notwithstanding the changes brought about by different conditions, there is a fixed law of heredity clearly recognized in breeding, which is to a greater or less extent under the control of the breeder, hereditary powers being capable of becoming increased or diminished, according to the course pursued.

Variability.—It sometimes happens that the offspring differ very materially from the parents. In many instances this will be due to a reversion to the original type, the variation being derived from some remote ancestor, the peculiar characteristics of which are occasionally seen cropping out in successive generations. Such cases will properly be classed with those of reversion, and not of true variation, where external causes may produce some constitutional or other change in the parent, which being transmitted to the offspring becomes correlated with some other change, which causes new characters to make their appearance. Hence, in selecting a certain character many other peculiarities may become correlated with the first or original one. It is a principle in breeding that all true changes or modifications which occur influence subsequent developments of the same parts, and also of others with which they are intimately connected. Dr. E. L. Sturtevant, in referring to correlated variations, says:

"In the correlations between bone and hair, we have different structures built up in part from the action of the same forces, as is shown by the history of their development. We therefore have a certain affinity between them, and a change impressed on one is apt to be followed by corresponding changes in the other. Were we sufficiently acquainted with the forces which go towards making up the animal, the numerous immediate forces could be referred to successive intermediate forces, into which they could be grouped, until finally the simple force would be reached,—a conception expressed by vitality in the abstract. Correlation is consequently but another expression of persistence of force. It is a recognition of the mutual dependence of all structures upon simple, harmonious law."

Prof. Brewer, an authority previously referred to in this department, expresses his opinion on this subject as follows:

"Heredity is not the only influence or force at work in the production and growth of the living plant. The seed is a marvelous thing; it is commonly very small, compared with the mature plant,—a seed of the giant *Sequoia* of California is no heavier than a mustard seed,—yet, stored in that little grain are all the powers derived from parents and ancestors

reaching backward to Creation, and all the possibilities of future generations of giants like the ancestors. Wonderful, however, as are the powers of that seed, after all they are only *possibilities;* other influences must aid or its power and being ends when it falls from the parent tree. Water must moisten it, and the sun warm it, or it will never even sprout, and if it grows, all through its life, earth and air and sun play each their part and do their work on its plastic nature.

Heredity gives direction to the growth, but it only partly controls it; all through life those elements which nourish it also modify it, and thus it naturally happens that the new plant is never quite like its parent. It may live in a better soil and grow larger, or be starved and be smaller, or other influences help to shape it, but whatever new character it takes on becomes a part of its being, and then heredity tries to transmit the new character to the next generation. There is *one* reason why the many individuals which constitute a species should differ among themselves, and why *cultivation* should tend to make the differences still greater, because art can supply conditions to influence growth which a plant growing wild would never find.

There is perhaps also an innate tendency to vary, inherent in living beings, a biological law opposed to heredity, weaker than heredity, always working with it, yet never strong enough to overcome it. This, however, is merely a hypothesis; personally, I believe in the existence of such a tendency, but many persons hold an opposite opinion. But whatever may be the cause, we see variation both in wild and in cultivated plants not explained by any obvious external cause. I will illustrate: Suppose we go into a field all white with the common ox-eye daisy. Instead of examining to see how near they are alike, as former botanists used to do, rather let us examine, say a thousand flowers, to see how they differ. All are daisies, but some are larger and some smaller, though growing side by side and nourished by the same soil and air; some have broad rays, others have narrow ones, some long and others short ones; in some the head is flatter than in others; some have the scales of the calyx closer than others, and so on through every character we examine. Now, experiment has abundantly proved that if we select plants having any one variation, plant its seeds and from the next generation again select the plants having that same peculiarity in the most marked degree, we will find that from generation to generation the successive crops, or at least some of each crop, will vary in that direction more and more from the original form, and in a few generations, more or less, we will make a new variety having that peculiarity in an exaggerated degree. We add up the slight variations until we have a large sum represented, and then this is a *variety.* I say this has been abundantly proved by experiment, and our gardens and fields are filled with the results. What the possibilities are of thus accumulating special character, no one knows; on its possibilities is based the Darwinian hypothesis.

What its applications are the race has known perhaps for thousands of years, for on it is founded, practically, the only means we have of *improving* any variety after it is once in existence."

There is probably no doubt that the unnatural and changeable conditions associated with domestication have more of a tendency to induce variations in organisms, than the conditions associated with a state of nature, hence, as a rule, wild animals breed truer than those domesticated, and there are fewer variations. Analogous variation is a term applied to those cases in which varieties of one species resemble distinct but allied species. Whenever this occurs it is supposed to be due to the two species having originated from the same source, or from their having a common progenitor, hence the modifying causes evolve similar varieties because of the similarity of the material which these forces have to act upon. Analogous variation is therefore closely allied to reversion.

It is evident that organisms propagated by sexual reproduction are generally most

liable to variation, since the offspring in such cases has a double chance of being influenced by conditions affecting the parents.

Selection.—In the whole theory of generation, there is no one principle of so much importance as selection, this being generally acknowledged as the chief element in successful breeding. To select judiciously animals which shall be successful pro-creators of their race, requires a correct judgment, nice discrimination, and a thorough knowledge of the art of breeding, and what has been distinguished by Darwin as *methodical selection*, which always implies that the breeder has before his mind a model upon which he attempts to form his strain, and like the potter who moulds his clay, the sculptor who chisels from rough marble, or the artist who causes dull canvas to speak in outline and varying tints of harmonious colors,—the breeder must have an ideal form or model after which he is to fashion the coming animal.

And not only must he have in mind the ideal form or model to imitate, but he must be able to decide which animals the most nearly approach this ideal, and also which are best suited to be paired together in order to produce the result desired. Breeding is therefore a real science in every sense of the word, and deserves to be classed among the high arts, while the masters in this art,—those who have been the most successful, in the past or present, are men of real genius.

Much patience, time, and labor are required in either establishing or perfecting a breed. Sir John Sebright is said to have spent several days in considering the rival merits of five or six birds, while founding the breed of fowls that bear his name. Hammond, the famous breeder of Merinos, is reputed to have reared 300 rams of this breed, and selected from them only one that he considered of desired perfection to be used in his own flock. It is said of Lord Rivers, who was noted for breeding elegant greyhounds, that he drowned nine out of every ten puppies among the litters of his choice kennel.

Chancellor Livingston bred his Merinos up from four or five-pound fleeces, to eight or nine pounds. Some of our modern breeders have attained the almost incredible result of producing fleeces weighing from sixteen to thirty-six pounds, the percentage of wool to live weight ranging from sixteen to twenty-two per cent. And this has been done by methodical selection, combined with good care and other favoring conditions. In Germany the Merino sheep farmers do not even trust their own judgment in selecting animals for breeding purposes, but employ what are called professional "sheep classifiers" for this purpose. Bakewell, who was the first true methodical breeder of which we have any definite knowledge, bred almost entirely for early maturity, and fattening qualities, and we have in the improved Shorthorns a breed that gives evidence of the astounding result of his efforts.

To show what the intelligent breeder has accomplished, we ask the readers to compare the illustrations in this work of the Texas and Longhorn cattle, with those of the improved Shorthorns, Herefords, and other choice breeds of the present day; the Wild Boar, Old English, and Old Irish hogs with the Berkshire, Poland Chinas, and other improved breeds of swine, or the cuts of sheep which were bred fifty or eighty years ago with the fine specimens from the flocks of Merinos, Cotswolds, Oxford Downs, etc., of our best breeders of these animals. The changes wrought are indeed wonderful, and yet they have been brought about mainly by careful selection.

The purer the blood of breeding animals, the longer and more firmly fixed will be the qualities and characteristics, and the more uniformly and intensely will these characteristics be transmitted. For instance, the Devon cattle are uniformly red, and no other color can be obtained from pure blood of this breed, because from time immemorial this color has been established by hereditary transmission. If the sire and dam both have fixed characteristics of a similar type, they will transmit them to their progeny as surely as the Devon bull enstamps his color on his get. Where the characteristics of the parents are of a similar type, those

qualities will therefore be intensified in the offspring; but where they are of a different or opposite type, the parent possessing the strongest hereditary powers will influence the offspring, but these characteristics will become weakened in time, unless the proper selection be made in successive generations.

The Best Animals of the Breed should be Selected.—No matter how pure the blood, individual differences are great, and some pure-bred animals possess the desirable qualities in a much greater degree than others; consequently in breeding, although the animals may have a long and faultless pedigree, select for breeding purposes the best of these, that is, those having the qualities most marked that it is desired should be transmitted. Even among the splendid race of thoroughbred horses, we find but few of great speed and superlative excellence. Huxley says:

"By selective breeding we can produce structural divergences as great as those of species, but we cannot produce equal physiological divergences."

Methodical selection, as practiced by modern breeders, has resulted in producing wonderful changes, in our domestic animals, and yet an unrecorded cause of modification has doubtless been long in existence, a cause which has been termed "unconscious selection," an instance of which has been given by Youatt, who, in remarking upon two flocks of New Leicester sheep owned respectively by Messrs. Buckley and Burgess, states that both of their flocks had been purely bred from the original stock of Mr. Bakewell for upwards of fifty years, and that there was not a suspicion existing in the mind of any one at all acquainted with the subject. that the owner of either of them had deviated in any one instance from the pure blood of Mr. Bakewell's flock, and yet the difference between the sheep owned by these two gentlemen was so great that they had the appearance of being quite different varieties. It is evident that neither of these breeders intended to alter the character of his flock, but endeavored to produce the best sheep of this breed possible, and hence, selected those for breeding purposes which approached most nearly to his ideal of a perfect New Leicester sheep; but owing to the different standards of excellence aimed at by these two breeders, the great difference arose. Even differences so slight as to be scarcely perceptible by the breeder may in the course of years produce changes so obvious that animals thus bred may seem like different varieties.

With respect to breeding for purity of blood, the object being to create and preserve a fixity of type, we must select animals possessing the same characteristics in order that we may invariably reproduce the good characteristics with greater certainty, and in an improved form in the offspring. If the individual animals be well selected, we shall in every generation gain stronger and stronger hereditary power and permanence of qualities. We shall concentrate the peculiarities of the race or breed. But we must avoid, as far as possible, any opposing influences in the parents, as tending to weaken the hereditary tendency in the young. We are to avoid anything like crossing, with the strictest care.

Respective Influence of the Sire and Dam.—If the sire and dam possess qualities and characteristics alike, they will transmit these qualities with force to their offspring; there will be a uniformity in their progeny that could never be obtained from parents of dissimilar characteristics. The nearer the parents are alike, the more certain will they transmit their qualities to their offspring, while when the two parents possess opposing or unlike qualities, the one which possesses the strongest hereditary qualities, or the strongest power of transmitting his qualities, will gain a preponderating influence over the offspring. Take, for instance, a cow with some special peculiarity of form, and breed her to a bull having points of form quite opposite in this respect, and the calf will take the character, so far as this peculiarity of form is concerned, of the parent which possessed the greatest hereditary power, or the greatest purity and unity of influence,—what we may call fixity

of type. And these hereditary powers are very largely under our control, to be increased or diminished by our own course of action.

If we take two animals to breed together, both possessing a strong similarity of type, the result we shall have will be an offspring possessing the like character, but in a higher degree. The result of putting together two animals of a strong similarity of characteristics is not only to perpetuate their corresponding peculiarities, but to intensify them in the offspring; that is, if the parents actually possess a striking similarity of type in any given point, each successive generation which they produce receives an increase of hereditary force, or an increase of power in transmitting its peculiar stamp upon its young. It is a cumulative power. But if this hereditary power accumulates, and becomes stronger and stronger, with a strong similarity in the parents to start from, it absolutely and invariably diminishes, if the parents, instead of possessing similarity of character, really possess an opposite or antagonistic character.

It reminds us of the familiar and well-known principle of mathematics, that two plus or positive quantities multiplied together will produce a far larger plus or positive quantity as the product; while if we multiply two unlike quantities, a plus and a minus, for instance, the result will be a minus, or negative quantity.

Professor Tanner, who is entitled to be regarded as high authority on this and kindred subjects, puts the matter somewhat like this:—

Suppose, for example, we have a well-bred ram, that, by long and careful breeding through several generations, has acquired certain strong and valuable hereditary powers, and suppose these powers, for the sake of illustration, are equal to 100, if they could be expressed in figures. Now, suppose we put this ram to a ewe of a different character, one that has been cross-bred, or bred without any care or system,—very much as our native sheep or our common cattle have been bred. She has, of course, far less hereditary power, far less fixity of type and strength of blood, as we say. Her hereditary power may be represented, we will suppose, by 60.

The result would be a lamb possessing very much the same characteristics as the ram, because we have seen the ram possessed a greatly superior hereditary power. To the eye he may look very like his father: but the hereditary capacity of this lamb will be greatly reduced, and his power of transmitting his peculiar characteristics will be represented by $100 - 60 = 40$. He may still look to the eye about as good as his father; but he will possess less than half his father's hereditary power, and less even than that of his mother. In other words, he may have all the perfection of form and marked characteristics; but his power of transmitting these peculiarities will be only in the proportion of 40 to 100, and for a breeding animal to get stock from he will be worth less than half as much as his sire.

In other words, if you select animals of a similarity of type, that is, if the likeness is strongly marked and well developed in both parents, the young will not only possess the same character as the parents, but it will possess an increased or multiplied power of hereditary transmission of these characteristics. But opposite characteristics mutually weaken each other's influence, and the offspring will have the power of hereditary transmission only in a greatly reduced degree. The exact proportion of this reduction of the power of transmission, or hereditary power, may not be precisely like that stated by Professor Tanner; but it will correspond with it in the main, and sufficiently for illustration.

These are a few general and well-established principles which have been arrived at by the most skillful and scientific breeders during the last half or three-quarters of a century; and it would be idle to dispute them, or to deny their force.

We are to bear in mind also, that this capability of transmitting the qualities or characteristics from the parent to the offspring is not limited to any one peculiarity of the animal,—like the secretion of milk, the disposition to take on fat, the strength of constitution,

the likeness of figure, or the habit of growth,—but extends to all the characteristic points of the parent animal. All the peculiarities of the system, physical and constitutional, are very largely within our control; and the character which results will be governed by the tendencies of the parents we select to breed from, and will depend on the adjustment of the balance of qualities, sometimes inclining to the side of one parent, and sometimes to the other, according to the respective power of transmission which has been spoken of.

If this power largely preponderates in one parent, owing to the length of time in which it has been carefully bred, or the number of generations through which it has become fixed and intensified, while it has been broken and weakened in the other by cross or promiscuous breeding, the character of the offspring will be governed almost exclusively by the parent that has the stronger blood; while the other will have but slight influence over the qualities of the offspring. But if there is a more even adjustment of this power of transmission on the part of the parents,—that is, if they are nearly or quite equally well bred,—the dam will succeed in imparting some peculiarities, and the sire will communicate others. The dam may impart the general form of the body, for instance, but be unable to control or overcome the stronger power of the sire over certain points of the body. The dam, for example, might have slightly deficient hind-quarters, and the sire a strong tendency to impart a good hind-quarter; and in this respect she would be compelled to yield to the superior strength of influence. In those points of character or features where they correspond, or were similar, both being good or both being bad, the result would be to increase and intensify such points, and to reproduce them in a still stronger form. In some particulars the influence of the male will predominate; in others, that of the dam.

So it will be seen that the hereditary qualities of long and carefully bred stock will represent the maximum of good qualities and the minimum of undesirable ones.

We have seen that the choice of the male to breed from is of special importance, because of the great extent of his influence; that is, the very large number of his offspring in proportion to that of the female among our domestic animals. But it is well established now that the influence of the male imparts vigor of body and general conformation of the system especially of the forward parts, and that he transmits to his progeny the qualities of the mother by which he was born. A well-bred bull dropped by a first-class dairy cow will produce a calf that will make, if a heifer, another good dairy cow. He will transmit to his daughter the qualities of his mother, if he have well fixed in his constitution the hereditary power to which reference has been made. In breeding dairy stock, therefore, it is of the utmost importance to study and know the quality of the stock from which the male has descended.

Prepotency of Transmission.—Whenever the offspring strongly resemble one of the parents, instead of being intermediate between them, such a progenitor is said to be prepotent in transmitting its likeness. The famous bull 'Favorite,' so frequently referred to in Shorthorn pedigrees, was remarkably prepotent in transmitting his characteristics to the Shorthorn race. The noted horse, 'Justin Morgan,' whose influence to this day is so strongly impressed upon the horses in some parts of New England, possessed this prepotent power in a remarkable degree; also Messenger, Rysdyk's Hambletonian and other well-known progenitors that might be mentioned. Breeders of horses cannot fail to have observed that some mares will transmit their characteristics with almost absolute certainty, while others of equally pure blood will produce invariably colts bearing the character of the sire.

It is stated by Godine that a ram of a goat-like breed from the Cape of Good Hope produced offspring that could be scarcely distinguished from himself when crossed with ewes of twelve other breeds, which showed that this animal possessed the prepotent force in a remarkable degree.

Mr. Brent, an English author, gives an instance of remarkable weakness in transmission

in the breed of pigeons known as "trumpeters," which is characterized by a tuft of feathers over the beak, by a crest on the head, and a very peculiar coo. In crossing a trumpeter with another breed of pigeons, and then recrossing the mongrels with trumpeters, he found it was only at the fourth generation, and when the birds had fully fifteen-sixteenths trumpeter blood in their veins that the tuft appeared, and even then, the peculiar trumpeting coo was absent. Sometimes certain peculiarities will be transmitted much more forcibly than others, an example of which is given in the following incident as narrated by a correspondent of one of our monthly journals:

"Several years ago a ship was wrecked near the Barnegat Bay (New Jersey) lighthouse. A male cat, with a bob-tail about an inch long, got ashore alive from the wreck, and, in process of time, the cats in that vicinity began to give birth to kittens with bob-tails. A male descendant of this cat is kept by one of my neighbors, about twenty miles distant from the Barnegat lighthouse. What portion of the blood of the original he may have in him, no one knows, but probably not over one-fourth to one-eighth. His color is calico, that is spotted, yellow and white.

I have a female cat of the Angora breed, which is nearly all white—only a few grey spots on it. The tails of this breed of cats are extra long, and quite bushy, something like those of the fox. Last June this cat was crossed by the above bob-tailed one, and the produce was five kittens, four of them having the form and color of the mother, and one only showing a little yellow of the sire mixed with its grey and white. But the curiosity of the thing is that, notwithstanding the long bushy tail of the mother, every one of the kittens came with a bob-tail, not exceeding an inch in length.

It is frequently asserted by breeders that the male is prepotent over the female in transmitting certain characteristics, but this rule holds good to only a limited extent, the respective influence of the sire and dam being modified according to certain conditions, which have already been pointed out. Even among animals equally pure in breed, and equally desirable as far as can be discerned by the external appearance, there will frequently be found a great difference with respect to their ability to transmit these characteristics and enstamp them, as it were, upon their progeny. Besides, in speaking of animals that are prepotent in transmitting their qualities, good breeders commonly term them "getters of their kind." When such an animal has been tested, it should be kept for breeding purposes as long as practicable, since their services, having been well tested, are known to be much more valuable than those possessing this power in a less degree.

The Animal and the Pedigree.—We have already given the most important general principles from which the judgment of each breeder will enable him to deduce many details to be applied in practice, the first and most obvious of which is to breed only from the best animals, not merely those that strike and fill the eye the most completely, but from those that have the hereditary power, the capacity to transmit their good qualities in the highest degree to their offspring, and the strongest evidence of this power will be the length and perfection of their pedigree, showing the qualities of the ancestors for some generations back, unless, indeed, some of their stock can be seen to tell as plain a story to the practiced eye of a judge of stock.

We have often heard practical men, intelligent men, who profess to know something about stock, and who ought to know better, say, "I don't care anything about your pedigree; let me see the animal, and I can tell whether I want to breed from him or not." Let us not deceive ourselves by any such assumption, from whatever source it may happen to come. It will be sure to lead to frequent disappointment; for, an animal may possess almost faultless form, and strike the eye of even the most experienced judge as possessing remarkably fine qualities, and indeed really possess them, and yet have no fixity of type, no great heredity of power; when, if put to a low or ill-bred female, he will be more likely than not to get poor

stock, or, at any rate, there will be no reasonable certainty of transmitting his own qualities. The importance of the greatest care in the selection of the male will be apparent from the fact that his influence extends to a far more numerous progeny. He should not only possess in the highest degree the good qualities sought after in the class of animals to which he belongs, but he should possess the power of transmitting them in the highest degree; and as this power is latent or hidden, and does not appear to the eye, it is to be judged either from the stock already got, or more commonly from the qualities of his ancestors through several generations.

And here again the quality of the pedigree—that is, the quality of the ancestry—is more important than its length. It is of little use or satisfaction to trace a pedigree back through inferior or ill-bred stock, except as a warning against the use of the male at the end of it. At the same time, the longer the pedigree the better, provided it shows a high character in the ancestry; for we have seen that the hereditary power, or capacity for transmission, is cumulative; that is, it becomes stronger and more intense and fixed from generation to generation where the respective parents possess similarity of characteristics, as is commonly the case in our well-established breeds.

It must, however, be remembered that we are not to rely on pedigree alone, but to select the *best* animals of pure blood for breeding purposes, since all pure-bred animals differ more or less in these qualities, some being much more desirable than others.

Inbreeding.—"In-and-in" breeding, as it is commonly termed, must of necessity be practiced to a certain extent in establishing a new breed, but when carried too far, the tendency is to lessen the size and vigor of the animal, as well as the prolificness of the progeny; hence close inbreeding has a tendency to induce sterility, while crossing is generally regarded by breeders as resulting in infusing vigor and hardiness.

With respect to the practice of breeding in-and-in, many conflicting opinions have been expressed; and the general conclusion arrived at is, that it is safe only within certain narrow limits, and then only under the hands of the skilful breeder.

Breeding in-and-in is commonly understood as an indefinite term applying to any near relationship; but its legitimate and proper application is to designate animals of the same blood as own brother and sister. But a son is only half the blood of his mother, and a daughter is only half the blood of her father. You may breed such relationship together to a certain extent without injury; that is, you may breed a bull to his mother or to his daughter, and greatly concentrate the hereditary power in the offspring. But even this course is to be followed with care and judgment, and not pursued too far. After reaping the first advantages to be derived from it, the breeder will do well to stop and consider. Breeding in-and-in, that is, own brothers and sisters, will give a more perfect form; but, if carried beyond one generation, it will be at the certain sacrifice of size, and perhaps of the strength of constitution. It greatly weakens the reproductive powers, and often leads to other and still more serious evils. Bear in mind that we refer to own brothers and sisters. More distant relationships can be put together with less risk, of course, and, if carefully watched to discover the least injury to the vigor of constitution, this course may be adopted to some extent where the design is to bring up a pure herd having certain highly important qualities which it is desirable to concentrate and perpetuate. At the same time, it should be borne in mind that pure-bred animals have now become so common and so numerous, that it will not be difficult to change the strain of blood sufficiently often to avoid any necessity of breeding from too near relationships. The necessity of breeding from close affinities will therefore rarely exist, except for the purpose of trying to build up a new breed, where, in some instances, it may be unavoidable.

Mr. Cheever, editor of the *New England Farmer*, gives a rare instance of inbreeding practiced for a number of years without any manifest injurious results. Mr. Levi Ballou, of

Woonsocket, R. I., commenced breeding the improved Suffolk pigs more than twelve years ago from two animals of this breed which he bred without taking in any new blood, breeding in every conceivable way,—mother and son, father and daughter, and brother and sister,—and raised an average of about one hundred and ten pigs per year; in ten years raising eleven hundred. Among those eleven hundred pigs there has not been one that was deformed,—every one has been perfect.

Mr. Cheever says respecting this case: "Perhaps I ought to state that this gentleman has a theory of his own. He always keeps a male for the service of his neighbors, but he never allows his neighbors' animals to be served until he has done using him himself. His breeders are kept in the very best health possible, with his knowledge and ability, and after he has used them himself, then his neighbors have the advantage of them. He accounts for his success in that way. That is a case of more thorough inbreeding than almost any other I know of in the country."

This is certainly a very exceptional case, for even in ordinary breeding it is unusual to raise a hundred pigs without having deformities of some kind; and more especially are such deformities liable to occur in close inbreeding.

Crossing.—Cross-breeding is the coupling of two animals of different and distinct breeds. The use of a pure-bred male upon a mongrel or grade female is not a case of crossing, but the term is frequently used, as between two strains of blood, or two families of the same breed. It frequently happens that the breeder may be desirous of engrafting a certain peculiar excellence of one breed or strain of animals upon another. As a general rule, the more widely the two breeds or strains differ, the more variable will be the offspring of parents thus crossed, since there will be a peculiar tendency to reversion, and the hereditary force is weakened, while the nearer alike the two breeds crossed, the less variable will the offspring be, and the easier will it be to breed true to the general characteristics. It is a noticeable fact, that the second, third, and often several successive generations, will prove more variable when mongrels or grades are bred, than the offspring of the first cross. Dr. Sturtevant says in this connection:

"In crossing animals of the same race we have a union of forces under the laws of breeding, but on account of our little knowledge concerning the relative strength and the combined action of the forces we are using, the results are apt to be exceedingly variable. When two forces meet in antagonism, each is modified and changed according to the law of mechanics, but neither force is obliterated; the effect of the struggle remains, while the forces may be in abeyance. Like the circular ripple of the pebble dropped in the water of smooth surface, the effect is ever acting, ever extending, and we thus have a series of actions modifying changes for all time. Characters in an animal are never obliterated, but may disappear from our view. We have, in crossing, a means for the modification of race, by producing changes through direct antagonism of force. We also have in free crossing a means for the preservation of uniformity between members of the same race. Like a two-edged sword, the law of crossing cuts both ways, according as its principles are applied, and under the government constantly of the great law of nature,—that of the persistence of force. As the antagonism of forces may be considered in the light of a mutual absorption, other forces, too weak to otherwise appear in a form recognizable to us, may appear. Hence, we say, that crossing produces a tendency to *reversion* or *atavism*."

In crossing and grading up, always use a *thoroughbred male*, and the purer the blood of the female, the better. A thoroughbred male upon low-bred animals always produces good results, but a low-bred or grade male upon any kind of stock whatever, will result in disappointment. Therefore never use a male grade in breeding, no matter how fine an animal he may be to look at, for he will not transmit his good qualities with any degree of certainty, but will be very likely to transmit the undesirable qualities of his ancestors. The rule for

every breeder to follow is,—always breed from the best specimens of the best-bred families, if success be expected, and always use a thoroughbred male.

Age for Breeding.—As a general rule, the female can be successfully used for breeding purposes at a considerably earlier age than the male. Her growth will necessarily be retarded somewhat by the consequent drain upon her system of maintaining the fœtus during the growing period, but this can be counteracted afterward by liberal feeding. Immature males will be liable to produce weak and feeble offspring, and weakness in the offspring tends to degeneracy of the breed; besides, if a male have his powers unduly taxed at an early age, they will be enfeebled for service in after years; hence his usefulness as a breeder will be greatly impaired. Where size is desired, as a general rule, breed from mature animals; but for milk production in all animals, early breeding is necessary.

In breeding for the dairy, we believe in bringing early maturing heifers in at two years old; for the reason that, at that age, the organs of secretion, like all parts of the body, are in a more pliant condition than they will be at a later period, and they are consequently more readily influenced. The secretion of milk is well calculated to develop them, and to enlarge them to their utmost capacity. If the animal is to become a large milker when she arrives at maturity, she must have abundant room to lay away large supplies of milk; and the capacity for holding these supplies must be created while her system is pliant, elastic, and easily influenced.

Let the heifer be served towards the end of July, in August, or early in September, if she will, and you bring the parturition in the following spring, at a time very favorable for the production of milk. In spring the grasses are green, abundant, and tender, full of rich milk-producing juices, which cause the largest development of the milk-forming organs.

If, on the other hand, the first parturition of the young heifer takes place in winter, the distention of the udder on dry forage is slight, and the product in milk corresponds. The milk glands will have but slight development. Soon this habit will become a second nature, so to speak, which no amount of feeding can wholly correct. The external signs of a good milker may be there; but the yield does not come up to the production which they indicate; and this fact will often explain an apparent exception to the established rules. We do not hesitate to say, that, in our opinion, a heifer coming in in May or June, and properly treated, will be worth a great deal more as a dairy cow than one coming in with her first calf at any other season of the year.

So far as our observation has gone (and the experience of the best dairymen will coincide), a heifer coming in at two years old,—if properly fed, carefully milked, forced up, if you please, to her utmost capacity of production, and made to hold out almost till the new milk springs for a second calf, will invariably make a better milker than one coming in at three years old. Of course, this supposes that the animal, as a calf, has been well fed, and kept in a thriving condition up to the age of a year or fifteen months, when she may be served. She should have a fair development and good growth, and it is better that she should be mated to a small, rather than a large bull. The draught on her system for the nourishment of the fœtus will be less severe than if she is fecundated by a large, over-grown bull.

Besides stimulating the mammary glands to great activity, and enlarging their capacity at this age, there is the additional advantage that the animal is more easily handled, usually more docile; she may be better managed; and she arrives at her maturity of production (which is not till after the third calf) a year earlier, so that a year is gained in her profit.

To offset these great and manifest advantages, there is the liability to some check in her growth and size, as previously stated, owing to the strain upon her system before it has reached its full development. This may be guarded against and counteracted by liberal and judicious feeding; and with this there will be no appreciable difference in size and thrift

between such an animal and one brought in at three years old, when they reach the age of four or five.

As to the age of the bull when put to service, our theory and practice are widely different; for, while most intelligent farmers are ready to admit that one year is too young,—that the system is not mature, that the animal is not developed, and ought not to be used,—they do, in fact, use yearling bulls far more commonly than older ones. If well fed and thrifty, we should not object to a limited use of a bull at fifteen months, and from eighteen months and onward more freely, in getting dairy stock and stock for beef. For getting working cattle, or animals for labor, the bull should be at least two years or two years and a half old. The bull is better to be worked; and, if it were our custom to use all our bulls more or less in the yoke, they would undoubtedly be all the better for it.

The age at which different animals should be bred will vary according to their maturing qualities, and other conditions, a subject which has already been treated in connection with the separate description, etc., of different kinds of farm stock. We have aimed in this connection to give some of the more important general rules and principles in the art of breeding, especial directions being found in connection with each special department of domestic animals.

Controlling the Sex of Offspring.—There has been much controversy on this subject, and many experiments have been cited to prove the opposing theories advanced. The subject of producing either sex at will interested the ancients as well as the present generation, and many rules denominated infallible were laid down by them, some of which were most whimsical and ridiculous. According to Professor Thury of Geneva, Dr. Naphy, and other eminent authorities, when conception takes place in the early stage of the period of the oestrum termed "heat," the result is a female, but if conception takes place late in this period, or when it is passing off, the result is a male. This theory has gained much favor, yet numerous instances from equally reliable authorities might be cited to prove precisely the reverse in results. Darwin states in reference to this view of the subject, that recent observations discountenance it.

Dr. Sturtevant says respecting it: "In my own experiments in this direction, I have obtained no confirmation, and I know of careful and reliable men who claim good results from the same theory in an exactly opposite direction, viz., that the first signs of heat influence a male conception, the last a female conception.

Prepotency seems one of the best determined incidents recorded in this relation. 'In several species of domesticated or cultivated animals (I believe in all),' writes Thomas Knight, 'particular females are found to produce a very large majority, and sometimes all their offspring, of the same sex; and I have proved repeatedly that by dividing a herd of thirty cows into three equal parts, I could calculate with confidence upon a large majority of females from one part, of males from another, and upon nearly an equal number of males and females from the remainder. I frequently endeavored to change these habits, by changing the male, but always without success; and I have in some instances observed the offspring of one sex, though obtained from different males, to exceed those of the others in the proportion of five or six, and even seven, to one.' My own experience in the 'Waushakum Herd' of Ayrshires is confirmatory of this statement, as are also the materials relating to births gathered with great labor from the Ayrshire Herd Book."

Dr. George Watt, of Ohio, an old physician and extensive breeder, after experiments extending over a period of fifty years, also arrives at an opinion directly the opposite of that of Professor Thury.

Notwithstanding the vast number of experiments that have been tried to ascertain the law which governs the sex of animals, no satisfactory result has been obtained. But it has been observed that the most vigorous parent will generally govern the sex; that is, that the

probabilities are, that the sex will take after the stronger, more robust parent. Thus, a feeble cow, or too young a one, or one too old (past her prime), fecundated by a vigorous bull, will most generally bring a bull calf; but the reverse will happen if the inferiority is on the side of the bull.

Thus, at the Agricultural College at Grignon, visited by the editor of this work a few years ago, forty-six parturitions of young heifers with their first and second calves, brought twenty-nine bulls and seventeen heifers; while twenty-eight parturitions of older cows, in their full vigor of maturity, brought eighteen females and ten males. So, at the Agricultural Institute at Hohenheim, which we also visited, a hundred and forty parturitions of young cows brought eighty males and sixty females; while older cows have always brought more females than males.

And so, if you put a cow that has recently calved, while still rather feeble, to a vigorous bull, the product will almost invariably be a male. A good dairy cow, with her strength of constitution constantly taxed, will bring more males than females, unless special pains are taken to increase her constitutional vigor by extra care and feed.

Dr. James Law, in an exhaustive treatise on this subject, sums up the results of his investigations, in the following conclusions: 1. "That while we cannot deny an occasional manifestation of the power of the maternal mind in determining the sex of the product of conception, yet this is only operative in a limited number of individuals, and cannot generally be availed of by the breeder, but is ever to be borne in mind as something to be guarded against as being a possible source of failure, on his part, to control sex.

2. Serving the female when her udder is full, may have a slight influence in producing female offspring, but only in exceptional cases, as it operates only through the mental impressions.

3. No confidence whatever is to be placed in any theory or plan based on a special point of origin for the spermatic artery, on the development of the impregnating fluid in the right or left testicle, or of the embyro in the right or left side of the womb.

4. The resort to sires and dams that breed mainly to one sex, is very plausible in theory, but as yet entirely unsupported by facts. Then again, if successful, it will fix in the breed a quality which a change of market may soon render a most undesirable one.

5. The doctrine of the regular alternation of sex in the ova successively matured, is not in harmony with some other physiological facts, and will require more extended and definite proof of its truth than has yet been furnished.

6. The doctrine of the female nature of the immature ovum, and of the male character of the ripe one, has many physiological considerations in its favor, and as applied to the uniparous animals, is supported by an array of facts that would warrant its adoption where-ever it can be consistently carried out.

7. That the maturity, strength, and vigor of the one parent has a great influence in determining its own sex in the majority of the progeny, while early youth, old age, weakness, debility, and exhaustion, lessens this prepotency, and allows a preponderating influence to be exercised by the other sex. That generous feeding of the dam, with rest, greatly favors the generation of females, while a poor diet favors the production of males.

8. That although the general tendency is to strike a fair balance between the male and female progeny, yet this, like all other physiological laws, will bend somewhat to the circumstances in which the race happen to live. Thus, under rich feeding, abundance, and ease, there is a stimulus given toward the production of females and the rapid increase of numbers. Conversely, under poor feeding and privation, the tendency is toward an excess of males, and the reduction of the race to proportions more in keeping with their supply of food. Again, when a great excess of males exists, it tends to correct itself by earlier impregnations, the generation of females, and a restoration of the balance of the sexes. Such laws having been ascertained, it is open to us to avail ourselves of them as of the other laws of reproduction.

9. That in seeking, by any method, to control the production of the sexes, we must bring as many conditions (laws) as possible to favor our purpose, and carefully obviate all known sources of fallacy, otherwise we may reach very unsatisfactory results and unfair conclusions. Thus, while avoiding, as far as possible, the disturbing influences of the imagination, and of animals that have shown an unconquerable disposition to produce one sex only, and while securing the desired relative conditions of age, health, and vigor on the part of sire and dam, we should attend to the necessary feeding, to the securing of early or late impregnation of the ovum, as the case may demand, and to any other circumstance that would promise to influence the result."

Numerous as are the theories advanced, and diverse as are the opinions entertained respecting this subject, it is still involved in much mystery, and is seemingly one of the secrets which Nature has thus far refused to fully disclose to man. The question that concerns the securing of male or female offspring at will, is one of great interest and importance to stock breeders, especially to breeders of high-class animals, and to owners of fancy strains of blood, individuals of which command extravagant prices, and where it would be desirable to secure a large preponderance of females, by which means valuable stock may be the more speedily multiplied. It is to be hoped that as intelligence increases, and as this subject becomes more thoroughly investigated and understood, information will be obtained which shall lead to the establishment of definite and reliable rules for the breeder, by which he can influence the sex of the offspring as desired.

Influence of the First Impregnation on the Dam.—The influence which the sire has upon the dam on her first impregnation, extending as it frequently does to subsequent impregnations by other males, is a mysterious one, and shows the importance of giving special attention to the quality of the sire giving the first impregnation, especially where pure-bred stock are desired. There seems to be an impression made upon the nervous system of the dam in many instances by the first conception, that will cause the likeness of the first sire to be enstamped upon the future progeny, irrespective of the quality of the males subsequently used. Thus mares have been known to entail the likeness of the sire of her first colt upon her colts for three or four generations, when bred to other horses. A well-known and remarkable instance of this kind occurred in the breeding of an Arabian mare to a Quagga, an animal resembling the Zebra.

The Earl of Morton, being desirous of obtaining a breed between the horse and the quagga, selected a young seven-eighths Arabian mare and a fine quagga male, and the produce was a female hybrid. The same mare had afterwards a filly and then a horse-colt by a fine black Arabian horse. Both resembled the quagga in the dark lines along the back, and the stripes across the forehead, and the bars across the legs. In the filly the mane was short, stiff, and upright, like that of the quagga; in the colt it was long, but so stiff as to arch upwards, and hang clear of the sides of the neck.

Mr. William Goodwin, veterinary surgeon to Her Majesty, states that several of the mares in the royal stud, at Hampton Court, had foals in one year, which were by Actæon, but which presented exactly the marks of the horse Colonel, a white hind-fetlock, for instance, and a white mark or stripe on the face; and Actæon was perfectly free from white. The mares had all bred from Colonel the previous year.

Alexander Morrison, Esq., of Bognie, had a fine Clydesdale mare which, in 1843, was served by a Spanish ass and produced a mule. She afterward had a colt by a horse, which bore a very marked likeness to a mule—seen at a distance, every one set it down at once as a mule. The ears are nine and a half inches long, the girth not quite six feet, and stands above sixteen hands high. The hoofs are so long and narrow that there is difficulty in shoeing them, and the tail is thin and scanty.

A pure Aberdeenshire heifer was served with a pure Teeswater bull, by which she had a

first-cross calf. The following season the same cow was served with a pure Aberdeenshire bull; the produce was a cross-calf, which, when two years old, had very long horns, the parents being both polled.

Mr. Shaw, of Leochel-Cushnie, put six pure-horned and black-faced sheep to a white-faced hornless Leicester ram, and others of his flock to a dun-faced Down ram. The produce were crosses between the two. In the following year they were put to a ram of their own breed, also pure. All the lambs were hornless and had brown faces. Another year he again put them to a pure-bred horned and black-faced ram. There was a smaller proportion this year impure; but two of the produce were polled. One dun-faced, with very small horns, and three were white-faced—showing the partial influence of the cross even to the third year. A small flock of ewes belonging to Dr. W. Wells, in the island of Grenada, were served by a ram procured for the purpose—the ewes were all white and woolly; the ram was quite different—of a chocolate color, and hairy, like a goat. The progeny were of course crosses, but bore a strong resemblance to the male parent. The next season Dr. Wells obtained a ram of precisely the same breed as the ewes, but the progeny showed distinct marks of resemblance to the former ram in color and covering.

Darwin cites the following case: A sow of Lord Western's black and white Essex breed was served by a wild boar of a deep chestnut color, and the pigs partook of the appearance of both sire and dam, some of them being strongly marked by the chestnut color of the sire. After the boar had long been dead the sow was served by a boar of her own black and white breed,—which are remarkable for breeding true, and never show any chestnut color,—but from this union the pigs produced were many of them strongly marked with the same chestnut color that characterized the first litter. This influence is not always perceptible, but is very liable to appear, hence caution should be used in this respect in breeding pure-bred stock. Professor Agassiz has expressed the opinion that the influence of the first male impregnating the dam is so great, that the chances are that every young of that dam afterwards will possess some of the characteristics of the first male that served her.

But not only will the first impregnation, but mental impressions received by the female during the period of the œstrum or heat, be likely to affect the offspring, and often to a very remarkable degree.

A Mr. Mustard of Angus, in Scotland, had a cow that came in heat while at pasture in a field bounded by one belonging to a neighbor, out of which an ox jumped, and went with the cow till she was brought home to the bull. The ox was white with black spots, and horned. The cow and the bull were not only hornless, but there was not a horned beast on the place, nor one with any white on it, the polled Angus breed being jet-black. But the calf in the following spring was black-and-white and horned.

A curious case is related of a Dr. Hugh Smith who was traveling in the country with a favorite female setter, when the bitch became suddenly enamored with a mongrel cur that followed her till he was obliged, in order to separate them, to shoot the cur. The image of this sudden favorite, however, still haunted the bitch, and for some weeks after she pined excessively, and obstinately refused intercourse with any other dog. At length she admitted the caresses of a well-bred setter; but, when she whelped, the doctor was mortified with the sight of a litter which he perceived bore evident marks, particularly in color, of the favored cur, and they were all destroyed. The same also occurred in her future puppings: invariably the breed was tainted by the lasting impression made by the mongrel. The mental impressions received at the time of the heat are sufficient to stamp the progeny.* We cannot be too careful to select the associates we keep with our pure-bred stock.

Breeding of Animals in a Wild State.—The animal in a wild state, or in a state of nature, has stronger reproductive powers, greater energy of the system and constitution, than one long under the influence of domestication, the natural laws being to some extent

interfered with by the efforts we have to make to establish and perpetuate certain peculiarities of the animal system, the extraordinary development of which is unnatural and artificial, but which development may be essential to our interests. The tendency to secrete milk, for instance, is a natural one, found in all animals that suckle their young; but the extraordinary development of milking powers is *artificial.* In the wild state the cow yields milk for only a short time, and that only in sufficient quantities, probably, to nourish her young.

In a wild state among gregarious animals, the strongest male leads the herd, taking his choice from it during his vigor, to be again and again succeeded by other strong males; hence, among such animals the same sire will often be found for two or three successive generations. A traveler in South America tells of seeing an immense and aged spotted bull, that was known by the inhabitants of that locality to have sired the wild herd for three generations, and who bore the scars of many a hard fought battle. Darwin maintains that a system of influences not wholly unlike those which man brings to bear in the breeding of animals, is found in the circumstances with which they are often surrounded in a state of nature. It is well-known, however, that, like savage tribes, wild animals are subject to but few diseases, and that artificial surroundings, artificial living and methods of breeding, have a tendency to produce diseases unknown in a state of nature. Animals that are confined much of the time in close, ill-ventilated stables, are more liable to disease than those that are much of the time in the open air; hence, farm animals in the country are less susceptible to disease than those in city stables, where the life of the horse, for instance, is wholly an artificial one. The same might be said of artificial breeding, as previously shown.

As we recede therefore from this wild condition by domestication, and subject the animal to a variety of circumstances which modify form and system, we frequently do it at the expense of certain qualities, for the sake of gaining other qualities better calculated to promote our immediate interest. The reproductive powers become weaker, the vitality and vigor of constitution lessened; but the formation of fat, or the tendency to produce meat, and the profitable production of milk, may be largely increased. That high breeding has this tendency to diminish the vital force and strength of constitution, is apparent enough when we consider how utterly absurd it would be to attempt to pit an improved Short-horn bull against a rough and ill-bred bull in a Spanish arena. The former would have the improvement knocked out of him before he had time to turn round.

BREEDING CALENDAR.

THE following breeding calendar will be found of value in determining the period of gestation of different kinds of farm stock; that of mares being usually 340 days; cows 285 days; ewes 154 days, and swine 130 days. The column of dates at the left denotes the time of service, and applies to the other columns as follows: for instance, if a mare be served January 1st, her period of gestation being 340 days will bring the time of her parturition to December 6th; if served January 6th, the time of foaling will be December 11th, and so on. A cow served January 1st will drop her calf October 12th; a ewe served at that time will drop her lamb June 3d; a sow April 30th, etc. Of course slight variations may result from various causes, but the dates given will be found to cover the usual period of gestation.

BREEDING CALENDAR.

Covering.	Mares 340 Days.	Cows 285 Days.	Ewes 154 Days.	Swine 130 Days.
January 1	December 6	October 12	June 3	April 30
6	11	17	8	May 5
11	16	22	13	10
16	21	27	18	15
21	26	November 1	23	20
26	31	6	28	25
31	January 5	11	July 3	30
February 5	10	16	8	June 4
10	15	21	13	9
15	20	26	18	14
20	25	December 1	23	19
25	30	6	28	24
March 2	February 4	11	August 2	29
7	9	16	7	July 4
12	14	21	12	9
17	19	26	17	14
22	24	31	22	19
27	March 1	January 5	27	24
April 1	6	10	September 1	29
6	11	15	6	August 3
11	16	20	11	8
16	21	25	16	13
21	26	30	21	18
26	31	February 4	26	23
May 1	April 5	9	October 1	28
6	10	14	6	September 2
11	15	19	11	7
16	20	24	16	12
21	25	March 1	21	17
26	30	6	26	22
31	May 5	11	31	27
June 5	10	16	November 5	October 2
10	15	21	10	7
15	20	26	15	12
20	25	31	20	17
25	30	April 5	25	22
30	June 4	10	30	27
July 5	9	15	December 5	November 1
10	14	20	10	6
15	19	25	15	11
20	24	30	20	16
25	29	May 5	25	21
30	July 4	10	30	26
August 4	9	15	January 4	December 1
9	14	20	9	6
14	19	25	14	11
19	24	30	19	16
24	29	June 4	24	21
29	August 3	9	29	26
September 3	8	14	February 3	31
8	13	19	8	January 5
13	18	24	13	10
18	23	29	18	15
23	28	July 4	23	20
28	September 2	9	28	25
October 3	7	14	March 5	30
8	12	19	10	February 4
13	17	24	15	9
18	22	29	20	14
23	27	August 3	25	19
28	October 2	8	30	24
November 2	7	13	April 4	March 1
7	12	18	9	6
12	17	23	14	11
17	22	28	19	16
22	27	September 2	24	21
27	November 1	7	29	26
December 2	6	12	May 4	31
7	11	17	9	April 5
12	16	22	14	10
17	21	27	19	15
22	26	October 2	24	20
27	December 1	7	29	25
31	5	11	June 2	30

Important Facts for Farmers.—In the breeding and care of domestic animals, the farmer should remember that it is not alone in the breed as such that success lies, but in both breeding by careful selection — always aiming to maintain and improve the desirable characteristics—and in generous feeding, kind treatment, and good care generally. A half-starved animal, unsheltered from the storm and obliged to shift for himself, will not be likely to maintain and perpetuate the valuable qualities he may originally have possessed, no matter how choice the breed, or to how great an extent the fine points of that respective breed may have been represented by him. Bad management would soon degenerate the best breed that has ever been established. We must not only *breed* well, but we must *feed*, *shelter*, and care for generally in a manner suited to the maintaining and perpetuating of the good qualities of the breed.

Dr. A. S. Heath, President of the Farmer's Club of the American Institute, New York city, has embodied some of the first principles to be observed in the breeding and care of animals, in a recent address before that Club, from which we take a few extracts, as follows:

"The structures of animals are specially adapted to their demands and natures, and *vice versa*. A special aptitude to fatten is incompatible with ample milk production in the race of bovines; and excessive weight of body and shortness of the limbs in the horse or hog is not suggestive of fleetness. Variation is observed in the readiness of animals to adapt themselves to new conditions, and the changes it produces in them, and especially by hereditary transmission to their offspring. Cold, exposure, and neglect produce degeneration, while care, shelter, and liberal feeding improve existing animals and their expectant offspring. These good results may also be freely transmitted to the progeny. Climate modifies both animals and plants. In tropical climates, with rich soil, many of our small grasses attain a gigantic growth; and in great altitudes, with poor soil, both plants and animals are dwarfed.

By judicious breeding, care, kindness, and liberal feeding, all the animals and their products become better. Milk is richer, meat is finer, beef and mutton are more tender and juicy, the very soil becomes fat, and the tiller grows richer and richer. Generosity to man, beast, and soil is profitable. Breeding animals must be healthy, free from defects of form, free from defects of constitution, free from predisposition to disease or weakness, free from bad temper or habits, must have sound digestive organs, and they must be capable of promptly and perfectly assimilating food. The breeder must intimately know the capabilities and characteristics of his breeding animals, so as to be able to adapt them to rear young which shall answer his preconceived wants. He must know that, all other things being equal, both parents equally exert the same amount of influence upon the progeny. This presupposes the equal health, vigor, and stamina of both parents. Both should therefore be as pure-blooded and perfect as possible.

Because it has been recommended that the male animal should be most highly bred, some have attributed to him the greater potential share in the procreation. This is only true because he is the parent of many annually, while the female is the parent of one, or of only a few during the same time.

Though food, climate, soil, altitude, exposure, shelter, care, kindness, and other operating circumstances may all produce great changes, yet, all operating at the same time, and for a long time on the animal and its progeny, cannot change the species. By selection we, in time, breed small-boned animals into large-boned ones; long-legged ones into short-legged ones; we can breed horned into hornless, and light-bodied ones into heavy-bodied animals. In a word, by selection the breeder can make the black white, the white black, the fruitful barren, the deformed straight, the perfect imperfect, the imperfect perfect; he can breed to a feather; he can produce a tendency to meat, to milk, to butter, to cheese, to capacity for labor, for speed, for endurance, or to serve almost any reasonable desire, demand, or fancy. By breeding from carefully-selected parents, the breeder can rapidly increase his flocks and herds,

by choosing those of great fecundity from which to breed—ewes from families that yean twins, cows that uniformly breed, sows that farrow large numbers of pigs—and it is just as essential that the males also should be selected from like prolific families and dams.

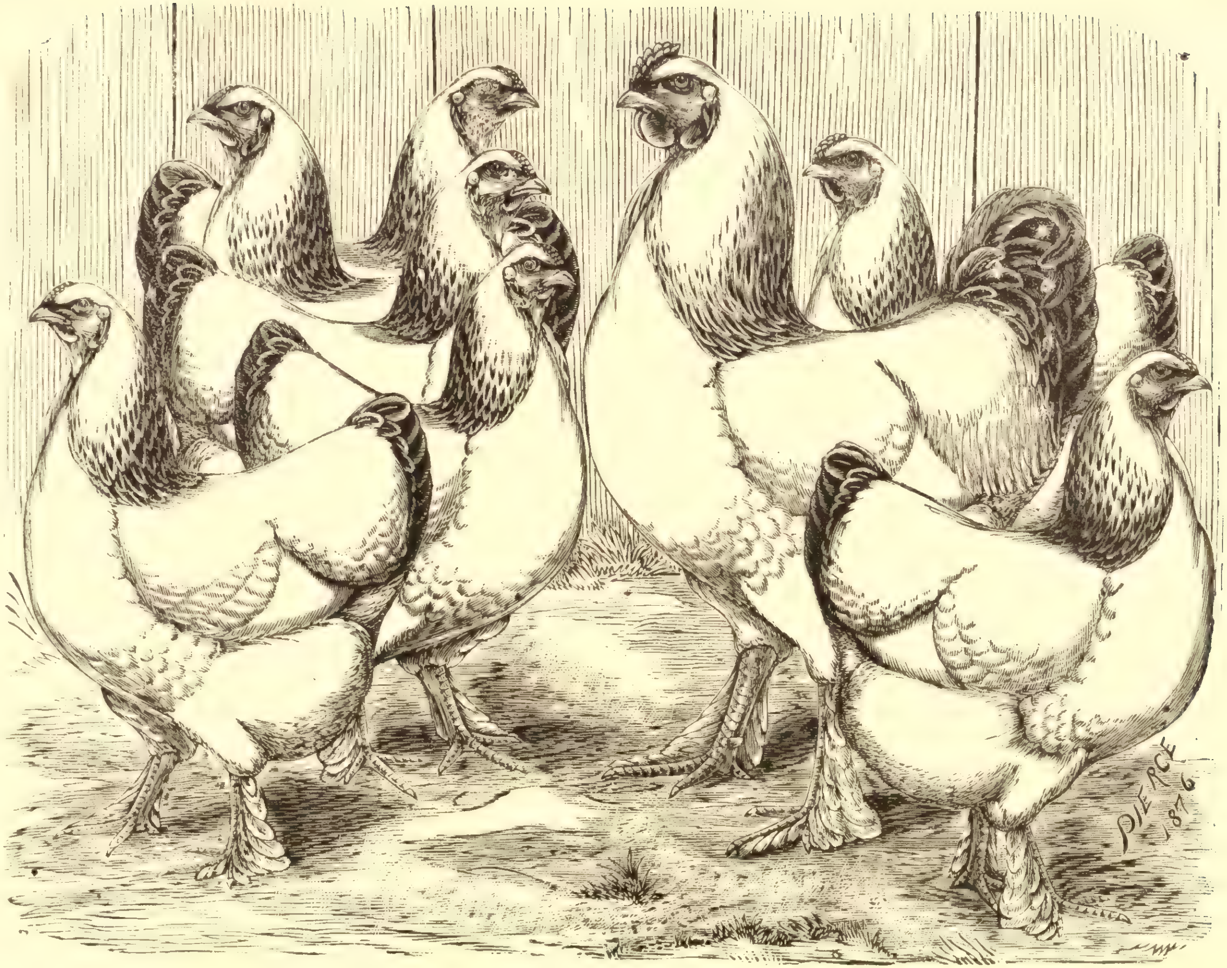
The terms "natural selection," "the struggle for existence," and "the survival of the fittest," have been freely used by Darwin and others to convey the idea of nature and methods to perpetuate her creatures. The wise breeder takes advantage of nature and methods to perpetuate the excellences which his acumen and judgment in selection have secured for the art of breeding. There are many things to be constantly borne in mind by the breeder: the laws of variation, correlation, atavism, the effect of climatic and telluric influences, care, kindness, feeding, and many other circumstances favorable or unfavorable to the modeling of form, to the production of animal products, to the perfection and perpetuation of desirable qualities, and the judgment, sagacity, and indomitable perseverance of the breeder, must often be taxed to the utmost limit of human tolerance.

Though pure-bred animals are most desirable to breed from, yet in our great herds of the West there are too few pure-blooded females to produce the vast herds and flocks imperatively demanded. We must therefore select the purest male animals to cross on our common females; and upon the best females of the first produce to breed up by the use of the same male, or one of like purity of blood. In-and-in breeding need not be feared, if the selection be judicious and the process be not too long continued. But a mistake too often committed, in careless and thoughtless breeding, is the use of grade males. Grade females are indispensable in extensive breeding; but a breeder had better mortgage, if need be, his land to secure pure-bred male stock animals than to use unreliable grades that cannot transmit with any degree of certainty the good qualities they may possess, and one too apt to transmit defects.

If size is desired, as a general rule, breed from mature animals. But for milk production, in all animals, early breeding is most essential. Cows are not profitable after eight or nine years of age for any purpose, unless they be of extraordinary excellence. Ewes cease to be at their best at the same age as cows, though, if highly bred and valuable, they may be still further bred. Mares have brought forth the most valuable foals between the ages of four and fifteen years.

Low, rich, succulent pastures are best suited for large, heavy animals; small, active animals to high, thin, dry pastures. Luxurious feeding diminishes hardiness. Low, wet pastures produce big, coarse bones, and large, flat feet in horses. In the wild state, the strongest males only beget offspring. Improvement in breeding goes step by step to the highest point of excellence. Prof. Tonner has shown that the lungs and liver of highly improved breeds are considerably smaller than in those animals at perfect liberty."

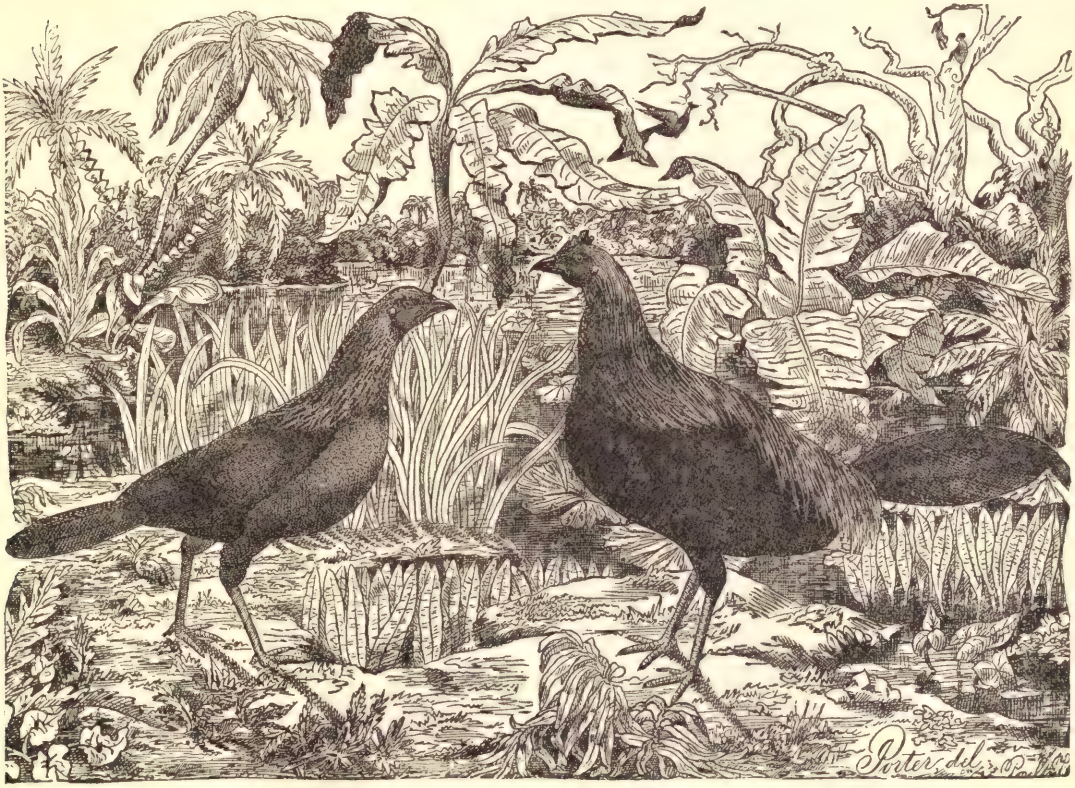
The stock breeders may justly be regarded among the great wealth-producers of the country, and Collings, Bakewell, Bates, Hammond, and other eminent breeders who have been the means of improving stock to the extent that they may be said to have almost created new types of animals, should be honored as public benefactors. The interests of the breeder and the farmer are identical; and the aim of the former should ever be the real and not the fancied wants of the largest class of customers to be the beneficiaries of their skill,—the practical farmers, to whom it is an interest of great importance to secure animals that will yield the largest and quickest returns on their investments. The best animals will, as a general rule, be found the cheapest, and the aim of the breeder and farmer should be to obtain such as are best adapted to the purposes for which they are to be used.



LIGHT BRAHMAS.
Bred by I. K. Felch, Natick, Mass.

POULTRY.

THE term poultry may be defined as meaning all domesticated birds (Gallinacea), such as the common fowl, the Guinea fowl, the turkey, and the pigeon; and palmipeds, as the duck and goose, as far as they are reared for useful purposes. The word poultry comes from the Latin word *pullus*, which means a chicken, or the young of any animal. The modern word poultry, however, may be said to more properly come from the French word *poule*, signifying hen; the word pullet being derived from the French *poulet*, a chicken. In the modern sense, the word poultry is more generally applied to the genus *gallus* or barnyard fowls, the word fowl being used with a prefix, to denote other species, as water-fowl, which applies to ducks and geese, Guinea-fowl, etc., while turkeys, peacocks, pheasants, etc., are usually designated by their particular name.

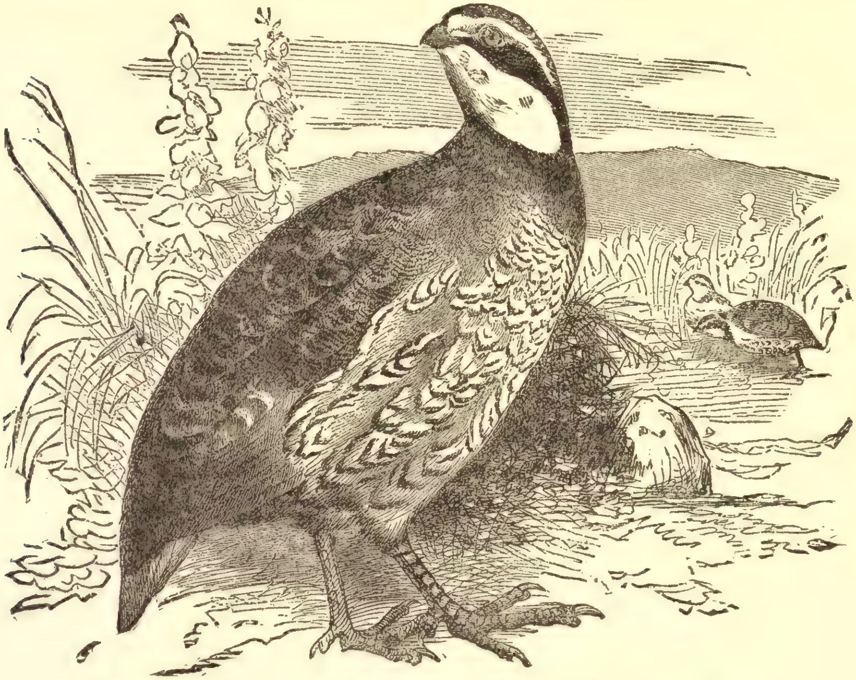


GALLUS BANKIVA, OR WILD JUNGLE FOWL.

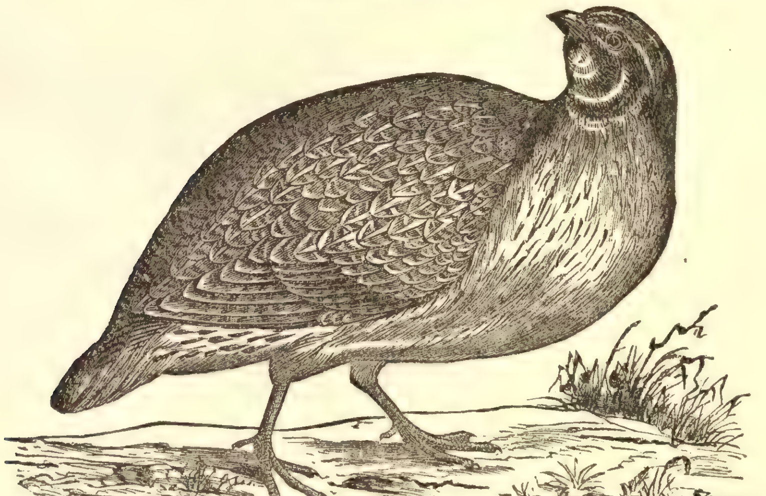
For sixty years or more enterprising breeders of poultry in this country and England have been endeavoring in various ways to improve the domestic fowl, forming new breeds for this purpose, domesticating wild birds and importing new races already domesticated in other countries.

Many foreign breeds have in this way been widely disseminated, such as the Asiatic fowls, the Aylesbury, Rouen, and Pekin Ducks, the Toulouse, Hong Kong, and Bremen Geese, the Bronze Turkey, etc. There still remain, both in this country and Europe, many desirable kinds of native fowl which might easily be tamed and made valuable breeds for domestic use; and it would not be strange if a few years' glimpse into the future would show us many

varieties in common use that are now only known as wild fowls, such as the Black, the Canvas-back, the Wood Duck, the various kinds of Wild Turkeys, Geese, Pheasants, Quail, the Prairie Hen (known as the Pinnated Grouse), the Partridge, etc., all of which a few genera-



AMERICAN QUAIL.



EUROPEAN QUAIL.

tions of domestication would improve in size, quality, and fineness of flesh, as experience has shown with our domestic fowls of to-day.

It is a well-known fact among bird fanciers and breeders of the wild fowl, that none of the large domesticated breeds of ducks were in a wild state larger than the average Canvas-

back duck or Mallard, but by long domestication are found to be one-third or half as large again as these are at the present time.

It is generally admitted by ornithologists that our domestic fowls are descended from the wild jungle fowls of the East Indies. The various species of the Game fowl still retain much of the form, color, combative propensity, and courage of this wild species. The Jungle fowl, known as *Gallus Bankiva*, resembles most of all the wild varieties our common Black-red Game, and that fowl is regarded as the immediate parent of this variety, from which so many sub-varieties have been bred by selection or crossing with others.

Intelligent Supervision essential to Success in Rearing Poultry.—Of all poultry, hens are the most easily and numerously reared, and also most profitable; producing a larger supply of eggs than any other of the feathered tribe, since they are peculiarly an egg-producing bird, having the same predisposition for laying that the cow has for milk secretion, and while some breeds are better adapted for laying than others, still our experience has taught us that all breeds, under proper and favorable circumstances, will produce a reasonable supply of eggs; and these favorable circumstances are,—a good house to roost and lay in, proper ventilation (without which no animal whatever can thrive or be perfectly healthy), cleanliness, a variety of suitable food, plenty of pure water to drink, sunlight at all seasons, suitable warmth in winter, and a reasonable extent of range and exercise, though some Asiatic breeds, like the Brahmas and Cochins, will do well for a long time with limited range, as they are naturally of quiet habits and disposition.

Due attention to these items will, we have no doubt, insure good success and fair remuneration from any of the well-known or common breeds of fowls, remembering that quite as much depends upon the care received as the breed, in the results obtained; and here we would say with emphasis, to impress its importance in securing success, that fowl rearing, like all other business, in order to be *profitable*, should have *personal care and supervision*, and *not* be left to the care of domestics, as in that case, even from the best and most trusty of them, the attention would, as a general rule, be inadequate to good results, and disappointment would be the consequence.

Intelligent supervision and personal attention are the essentials to success in poultry raising, and unless that supervision and attention can be given, we would not advise any one to attempt to engage in the undertaking.

Pleasure and Profit Attending Poultry Raising.—Much pleasure, as well as profit, may be derived from the care of poultry; they engage the sympathy and interest, and have a tendency to awaken the kindliest feelings of our human nature, which, if rightly matured and cultured, cannot fail to make us more humane and close in sympathy with all created and living things; besides, but little time, comparatively, need be spent in these duties, where the arrangements for their keeping are what they ought to be, for health, comfort, and consequent profit; while with the use of a little ingenuity, this may all be done without soiling so much as even the fingers. It is well for children, in the influence derived, to have the care of something; it calls out their affectionate interest, and makes them more considerate and gentle in their treatment of inferior animals, and if there be children in the family old enough to be entrusted with these duties, they will derive much benefit and pleasure by attending to what will soon become their pets; for, with kind and gentle treatment, all fowls will soon become tame and fearless of those about them.

In France, and some portions of England, it is customary for the ladies of the household to have charge and personal care of the poultry, and we are glad to know that in this country the practice is not entirely unknown, though it is not as common as we might wish. We believe if this custom were more general with American ladies, there would be less complaint and criticism among physiologists on account of their early loss of beauty and

health for lack of out-of-door exercise. With regard to the scope for the exercise of the æsthetic perceptions in such employment, a recent writer has well said:

"We can assure the ladies that in this specialty there is great scope for the exercise of æsthetic perceptions. What can be more beautiful, for instance, than the penciling of the gold and silver Hamburgs; the exquisite harmony of color which the best-bred Gray Dorking pullets exhibit, and which we think come nearer the wild game birds of the country in beauty of form and plumage than any other?

Then there are the numerous strains of game fowl, the *preux chevaliers* of their race, unexcelled in splendor of plumage and unequalled in grace of form and carriage; the Houdans, helmeted like cuirassiers, and the plumed Crevecœurs, the *black-horse cavalry* of the poultry yard; the La Fleche with its branching antlers, and the black Spanish and Leghorns, whose battlemented combs of the brightest crimson, flaming above the raven and snow of their plumage, entitle them to be considered the *color guard* of the grand poultry army. Then there are the stately Brahmas and Cochins, the giants of their race; the black Polands with their crowns of snow, and their golden and silver cousins beautifully marked; and last come the sprightly little Bantams, whose pencilings have made immortal the name of Sir John Sebright, and whose tints are almost as various as the wild flowers of spring. Is there not a field here sufficient to tempt the most æsthetic taste?"

The pleasure afforded by this employment,—the health derived from the consequent out-of-door exercise, would well repay any lady for undertaking the task, to say nothing of the pecuniary profit to our farmers' wives and daughters, that with proper management would certainly result therefrom, and thus a very desirable amount be added to the yearly supply of "*pin money*," which sometimes fails to meet all the demands made upon it. We know of no employment that yields so large a per cent. of profit, with so little care, as poultry raising, whether for eggs, market, or for sale as fancy stock.

The Best Breeds of Fowls to Keep.—There is probably no question regarding poultry, more common, or more perplexing than, "Which are the best breeds for general purposes?" since so many of the popular breeds have each their advocates, who give them the first choice as their especial favorites, and urge claims to equal points of merit. We find it true in almost all instances, that where a breeder has been particularly successful with some especial breed or breeds, choice will lie naturally in the direction of his success, while another might be equally fortunate with a breed entirely different, and urge his claim as strongly in favor of that particular breed.

In the selection of a breed of fowls, many things must be taken into consideration, such as the situation, the range, the character of the soil, the object which the purchaser has in view,—whether production of eggs or poultry. If there be plenty of range, with eggs the main object, the Leghorns, Plymouth Rocks, Houdans, Game, and Hamburg varieties will be found among the most profitable. Hamburgs are exceptionally good winter layers, and are said by some breeders to produce more eggs in a year than any other breed, as they are non-sitters and lay almost every day, except when moulting; their eggs are, however, rather small, while the fowls must never be crowded, and must be kept with *very clean surroundings*, as few breeds suffer so much by overcrowding, poor ventilation and filthy conditions as the Hamburgs. As winter layers, the Plymouth Rocks have few equals, and no superiors. If however they are confined and fed exclusively on corn, they are apt to become so fat as to seriously interfere with their laying. They require a good range; at least an acre of grass to every twenty-five fowls. If the range is limited, Brahmas, Cochins, and their crosses will be most profitable, and even whether the range be limited or not, the Brahma has few equals in laying qualities; but care must be taken, as with all fowls, that the food consist of variety, and not exclusively corn.

Where the soil is heavy and inclining to be damp, the Dorking, Black Spanish, and

Poland varieties will be found especially unprofitable, since with these conditions they would be liable to roup tendencies. The Spanish lays well in the spring and summer, but is regarded by many as a poor egg producer in winter; the eggs are, however, very large and delicate in flavor. The Poland varieties are prolific layers, non-sitters, and their flesh is remarkably good, but their great fault, as we have previously stated, is a tendency to roup, being easily affected by the cold, dampness, or bad weather.

If the object of the purchaser in the choice of fowls is the meat quality, or the production of poultry, we can recommend no better breeds than the Dorkings, Houdans, and Brahmas. The Dorking, which is regarded with so much favor in England, and is the favorite fowl in the London market, has probably no equal as a table fowl; its fineness of meat fibre, and delicate flavor, have placed it first in this respect, though it is not a very desirable fowl for egg production. The chickens, however, are very delicate in constitution, and sensitive to cold or wet weather, and in consequence should not be hatched before May, and should be kept where the soil is dry, with plenty of range.

The Houdans nearly equal the Dorkings as a table fowl, are extremely hardy, good layers of large-sized eggs, making them in all respects a very desirable fowl for the farmer. They will bear a moderate amount of confinement, but never sit; consequently when keeping them it will be necessary to keep a few hens of some other breed,—Brahmas, for instance,—for purposes of incubation, unless an incubator be used for hatching chickens artificially. Brahmas are quite hardy, grow rapidly, and make an excellent table fowl, as well as an egg producer.

J. K. Felch, Esq., of Natick, Mass., one of the best-known poultry breeders of this country, furnishes us the following for this work, as his opinion on the comparative merits of different breeds of poultry:

"To write of the comparative merits of different breeds of fowls cannot fail to run in opposition to the opinions of many breeders, for the reason that, as a rule, men follow the bias of their own individual taste and fancy on the subject of poultry keeping, as well as other matters; consequently, they are especially interested in their choice, and the fowls get excellent care, which results in a good profit to the breeder, who, being more than satisfied with his experiment, straightway votes the breed *he keeps* as 'the *best.*'

To say what we know upon this subject, in the fewest words, we will briefly mention a few of the merits and defects of different breeds in the order of their respective excellence, as we regard them.

Of all the Asiatic class, Light Brahmas must be acknowledged as being the most perfectly bred. A large number of the chickens reach ninety or more points as show birds; besides, they are the best winter layers, and more apt to lay through the moulting-season than any of the large breeds. Their eggs bring from five to seven cents more per dozen in the market than do the eggs from the small breeds. A Light Brahma hen will lay one hundred and fifty eggs, and hatch and rear a brood of chickens in a year; the chicks make nice broilers at from eight to ten weeks of age, and retain the tender and juicy excellence of meat quality as roasters from eight to thirteen months of age.

Their demerits, as we regard them, are a tendency to over-fat, as fowls, which necessitates great care in feeding; and also that between the age of from three to six months, — the time when they grow so rapidly in bone, — they are not during that time as desirable for table use. Taken all-in-all, we do not hesitate to say, that they are practically the best of all the breeds.

Of the balance of the Asiatic class, for a bird of real merit, we place the Black Cochin in the front rank. These fowls are short-jointed, and quick to mature, and will lay equally as well as the Light Brahmas; the hens being also good mothers. They do not hold their excellence as roasters beyond the age of ten months; the principal plea in favor of the Light

Brahma as a preference being their roasting merit so late in the Spring, when good poultry is very difficult to obtain.

The Dark Brahma and Partridge Cochin, as far as practical fowls are considered, in our opinion, come next in merit. When exquisitely penciled, their plumage is exceedingly beautiful, but as they do not produce so large a number in a hundred, fit for exhibition, that is, do not breed so perfectly, and true to color, and are also less prolific, as layers, we must place them in the third rank; but to the fancier, whose pleasure is found in the most bright and beautifully colored plumage, the Partridge Cochin will take the lead, while the more modest tints, with equally fine penciling, seen in the plumage of the Dark Brahmas, find many admirers.

Of the poultry found in the middle group, viz.: Plymouth Rocks, Houdans, Black Javas, Crevecoeurs, La Flèche, etc., we would say, for the New England and Middle States, for practical purposes, the Java and Plymouth Rocks are of equal merit, while the South Middle States could produce the Houdan with profit; but to speak of each, we say, if forced to choose, we would give the Plymouth Rock the preference; its great excellence being rapid growth, and its adaptation to making good broilers; a demand so large during the summer months. The young chicks make fine broilers at the age of twelve weeks, and are very hardy; they mature early, laying at five months of age, hence are good fall producers of eggs. Demerits, not good roasters, as they become tough and hard in flesh soon after six months of age, and are no more than average producers of eggs in winter.

The Houdans are quick growers, and like the Plymouth Rocks must, as poultry, be marketed before seven months old; they are good layers of white eggs, but their heavily muffed and crested heads make them predisposed to lice, and in damp weather they are also liable to roup, requiring great care as to quarters free from dampness and drafts of air, which has made them undesirable for New England climate; but in a more southerly climate, we believe them better than the Plymouth Rock, where light-colored meat is tolerated, and a preference given to white eggs; for it is a fact that they will produce more eggs in a year than the 'Rocks,' or Java fowls, but the chicks, in a northern climate, cannot be called hardy or easily reared.

We class the Game fowl among the lesser medium-sized birds. They are the fancier's stock, and the Black-Red variety may be called both the aristocrat and pugilist of the poultry yard. It is true, that at four months of age their flesh is as fine, if not finer than any other, but as their eggs seldom reach a number in excess of one hundred and twenty-eight yearly, we can call them no more than an average, and by no means up to the best breeds for practical purposes. The chicks are hard to rear.

The Black Spanish may also be called of the lesser medium class in size. They are fair layers of large white eggs, and average about one hundred and twenty-five in number during the year; yet their eggs will, we think, weigh as much as one hundred and fifty eggs of the Leghorn variety, of the Spanish class. While we consider the race not a profitable one for practical purposes, yet its class with the Asiatic is a very prolific egg-producer.

Among the small varieties, we think the Leghorn the best, and possessing far more merit than the Hamburgs, yet the latter are much prized for their exquisite beauty of plumage, and though delicate to rear, they seem quite hardy when once mature. Their eggs are small and white, and a single hen has been known to lay one hundred and fifty-one eggs in six months; but as a rule, one hundred and sixty eggs would be considered the full average for a year.

The Leghorns are the most prolific layers of all the breeds; the best authoritative record yet known is that of fifty-one hens with an average of two hundred and seven eggs each, and a profit of $4.04 per head for the year, being the 'banner' statement yet on record. They are of small size, but make very good broilers, yet as roasters are positively worthless, being

too small and tough, when fully grown. With these remarks on the breeds, we come back to the summary, and say, that in New England and the Northern Middle States, Light Brahmas, Plymouth Rocks, and White Leghorns are the best for practical purposes, and since others will pay the breeder less, they become less valuable in comparison. For the Southern, Middle, and South Western States, we recommend Light Brahmas, Black Cochins, and Javas for large stock; Houdans for the middle size, and Leghorns.

As the temperature of the Southern States admits of birds being raised at all times of the year, we would recommend for that section of our country, Light Brahmas and Black Cochins for large stock; for those of smaller size, Houdans, Plymouth Rocks, and Leghorns. All other breeds must be looked upon from a fancier's standpoint, wherein taste must be the rule, as they are kept quite as much for pleasure as profit. But do not consider us as condemning outright all other birds, for we do not.

They will all pay a profit over and above their keeping; the Creator of all things has made them with qualities suited to their purpose, and just in proportion to the care we give our fowls, will we reap a harvest, no matter what the class; for instance: if the Light Brahmas lay ten eggs more in a year than any other of the Asiatic class, then they become the best practically, and must be the bird chosen, as one Light Brahma hen pays the interest on three dollars more, as an investment, by her earnings. This however does not argue that all the Asiatics are not good.

Just so with the middle class,—locality and adaptability being first considered, next, the economic value. While Houdans may be better for France, and Black Javas for all purposes where only one breed is to be kept, and eggs as the sole product; we find that White Leghorns are the best for all sections of the country, since they will lay more and larger eggs than any of the non-sitting breeds, except the Black Spanish, which lay larger eggs, but being more delicate to rear, and less desirable as a table fowl, must go into the list of fancy stock; —hence we see that for the greater profit, in both poultry and eggs, the Light Brahmas, Plymouth Rocks, and Leghorns are the three best, while the best cross for all purposes is the mating of a White Leghorn cock to a Light Brahma hen."

To show the various preferences of bird fanciers and breeders on the subject of choice, we give a few other opinions from different sources. An extensive breeder gives his opinion as follows: "From all I could learn after a careful study of the subject, I decided that for both meat and eggs, no variety ranked higher than the Light Brahma, while for eggs the Brown Leghorns; were perhaps first. For experiment I wished varieties as diverse as possible, and secured them in the above breeds. The color and size of the eggs, and the appearance, habit, and temperament of the fowls are indeed very wide apart. With the Light Brahmas we have not been disappointed. They have proved even better layers in winter than our Brown Leghorns; their eggs are fine in quality, large, and of rich color. At the age of six months the cockerels weigh seven and eight pounds, and while they may not quite equal the Games, the Dorkings, or the Houdans for table use, I am sure no one will go away hungry or dissatisfied from a dinner graced by a Light Brahma.

From my own experience, as also from a thorough study of the opinions of others, I think there is no fowl that equals the Light Brahma for the farmer. Possibly the Plymouth Rock may rank nearly as high. The quiet temperament, too, is a recommendation of no mean rank in favor of these fowls. The chief objection, and the only one, so far as I know, unless we might desire a little more white meat, is the proclivity of this breed to sit. With suitable preparation to break this determination, it is no serious objection, especially if we kill all our hens the second winter, never keeping them until they are two years old. I have noticed that there is a great difference in individuals in this respect. So without doubt by careful selection in our breeding we could modify this trait to our satisfaction.

The Brown Leghorns I have found to be perfect non-sitters. They are admirable layers,

except in cold weather—perhaps my house is not warm enough for them—when I have found them much inferior to the Light Brahmas. The eggs are white, large, and fine. The Leghorns mature quickly, when they weigh three or four pounds, and are, I think, almost useless for table use. They are wild and intractable. A fence five feet high is Brahma proof. As much cannot be said of one three times as high if the word Brahma be replaced by Leghorn. I cannot recommend the Brown Leghorn, though I have a flock for sale. From my reading, and a slight experience, I think I might almost say as much of the Spanish, the Hamburgs, and the White Leghorns.

Though I am satisfied with the Light Brahmas I have a desire to test the Games, because of their incomparable excellence for table use, and the Plymouth Rocks, which are so highly recommended by those who have them. Yet I feel assured that this test, which I am to make in coming years, will only serve to make me more a friend of the Light Brahmas. The grace and symmetry of the mature Light Brahma is fully comparable to that of our best-bred Short-horns, while their color forms a beautiful contrast to the green of the summer landscape."

Another writer of experience speaks in equally complimentary terms of the Houdans, and after mentioning the popularity of the Light Brahmas, Plymouth Rocks, Leghorns, and Hamburgs, says, that for hardihood, laying qualities, and as poultry for the table, they (the Houdans) have no superiors, and expresses regret that more of our breeders do not turn their attention to them especially. The writer bred them for years side by side with Games and Dorkings, losing no chicken by disease, when he lost one out of four of the Dorkings, and one out of ten of the Games.

Another breeder of large experience expresses his preference thus: "How much easier to give the poultry the little attention required, than is the trouble of raising, and the care of cattle, which no thrifty farmer ever complains of! When we pass a neat-looking farm, the buildings in good repair, the cattle and sheep fat and contented, and the home of a nice flock of Plymouth Rocks, Brahmas, Leghorns, or some other varieties, is not there, something is wanting to make that farm complete; for where is the individual that was brought up on a farm where poultry was kept, that does not remember the happy hours feeding the chickens, and hunting eggs in the hay-loft in his boyhood? No farm is complete without a well-regulated poultry-yard of thorough-bred poultry. How surely they pay for every kernel of corn they eat! In consideration of the importance of poultry to us, the question presents itself, What breed should we keep?

In raising poultry for market, we recommend Light Brahmas, Dark Brahmas, Plymouth Rocks, Houdans, and White Cochins. These are quick to grow, take on fat at an early age, and are of excellent color when prepared for market. If eggs only are wanted, then some of the small varieties are recommended, White and Black Leghorns, Brown Leghorns, Games, and Hamburgs. We have about twenty White Leghorns, and know they are excellent hens to lay. Whatever breed you keep, they require proper care and food: the better care and keeping the larger the returns will be."

Mr. W. H. Todd, of Vermillion, Ohio, says: "We should classify the best breeds for fowls and eggs in their order as follows: Dark and Light Brahmas, Partridge, Buff, White, and Black Cochins; for size, eggs, and all purposes, with early maturity, Plymouth Rocks, Black Cochins, and Dorkings; the latter we don't recommend for this climate, as they are too liable to disease. For eggs, we should place non-sitters at the head of the list: should say Leghorns, Houdans, Hamburgs, and Spanish; of course where non-sitters are kept, it is necessary to keep a few Cochin or Brahma hens to perform maternal duties. For whatever purpose we keep fowls, it is best to so keep them that they will be a source of profit rather than a bill of expense.

When breeding for fancy, a handsome profit can be realized in the production of

eggs, and the cull stock for the table and market. Respecting the number of breeds, it is best to keep no more than we can keep well and have room for. We are not of those who believe no person capable of keeping but one breed and making a specialty of it. We do believe that one breed is all a great many people should keep, and more too, while there are others who can keep a large variety and breed them all well. We hold there is no limit to man's capacity to acquire knowledge and develope the mind in any given direction. That with ample room, where poultry breeding is made the sole business and study, no one breed will satisfy the desires or gratify the tastes of a mind large and active."

We add one more to the list of testimonials on this subject, the opinion of the editor of *The Poultry World*, which is as follows: "Some beginners, and many that are contemplating keeping a few prime fowls for pleasure and profit, unless previously informed by reading some good poultry paper or book, often ask, "What breed must I keep to obtain the most beautiful plumage, the most prolific layers, the greatest size and weight, and the sweetest and best flavored flesh?"

Poulterers must not expect to find all these merits in one variety. A breed that would combine all these beautiful, useful, and profitable qualities would certainly include ideal fowls. Nature wisely apportions and compensates, distributes and divides to each breed or variety certain or special merits, but at the same time she never violates her inexorable laws by allowing them to excel in an eminent degree in all things.

Some breeds excel in hardiness, adaptation to exposure and climatic changes, as for instance, the Langshan, Dominique, Cochin, and Plymouth Rock. Now, nature does not provide these with gorgeous plumage; they wear a sombre and plain every-day dress, and are well fitted for a cold climate. The Polish fowls are very ornamental, and good layers. These prominent qualities make them special favorites; but they are not hardy, nor is their flesh as toothsome as that of some other breeds.

The Dorking is superior to any of our domestic breeds for delicate and well-flavored flesh. This quality commends them to epicures and all lovers of sweet and nutritious meat. Yet in points of laying, hardiness, and external beauty they are not superior.

The Spanish fowls are all great layers; this is their *forte*. We see a sameness in their appearance; almost all are clad in solid colored plumage, and are deficient in gorgeous tints or exquisite pencilings, and their flesh is not as rich and juicy as that of the Dorking.

The Hamburgs are among the most beautiful of our varieties; they are superior layers, but their flesh, though good for home use, is unprofitable, on account of light weight, for market purposes.

The Asiatic varieties excel in size and weight; they are hardy, quiet, well acclimated, and the best of winter layers. But for grace, carriage, sprightliness, and attractive plumage, they are not equal to some smaller fowls.

The Games are noted for their varied and matchless plumage; some of the varieties are transcendently beautiful. The rich, glossy colors, the iridescent gold and purple, that harmonize with vivid and metallic green, are exquisitely handsome, and make a good offset to what some consider prominent defects.

Thus we see how difficult it is to attain perfection in all things. We are striving on our progressive march to combine most of these rare qualities, and we have accomplished much toward this end; still, we must keep in mind that "Excelsior" is our motto.

It will be seen by the perusal of the previous statements by noted breeders of poultry, and writers on that subject, that the number of valuable breeds is "legion," and while in minor points each individual fancier may have his own peculiar preference, and perhaps favorites, from having bred them most, and therefore the best acquainted with the breed, still they all agree sufficiently in the main, on the merits of standard breeds. The novice in poultry matters has therefore only to consider what qualities he desires most in his stock,—what breeds are best suited to his locality, climate, soil, general surroundings, extent of range for his fowls, etc., and select accordingly.

GLOSSARY OF TECHNICAL TERMS.

THE following glossary of the various technical terms used by poultry fanciers, together with the illustration representing the points of poultry on a following page, may be of value to those not already familiar with them, in understanding the description of the different breeds of fowls:

Beard.—A bunch of feathers under the throat of some breeds of chickens, such as Houdans or Polish.

Breed.—Any variety of fowl presenting distinctive characteristics.

Brood.—The family of chicks belonging to a single mother.

Broody.—Desiring to sit or incubate.

Carriage.—The attitude or "style" of a bird.

Carunculated.—Covered with small fleshy protuberances, as on the head and neck of a turkey-cock.

Chick.—A newly-hatched fowl.

Chicken.—This word applies, indefinitely, to any age under one year old.

Clutch.—This term is applied both to the batch of eggs sat upon by a fowl, and to the brood of chickens hatched therefrom.

Cockerel.—A young cock.

Comb.—The fleshy protuberance growing on the top of a fowl's head.

Condition.—The state of the fowl as regards health and beauty of plumage.

Crest.—A crown or tuft of feathers on the head, of the same significance as top-knot.

Crop.—The receptacle in which a fowl's food is stored before passing into the gizzard for digestion.

Cushion.—The mass of feathers over the rump of a hen, covering the tail,—chiefly developed in Cochins.

Dubbing.—Cutting off the comb, wattles, and ear-lobes, so as to leave head smooth and clean.

Ear-lobes.—The folds of bare skin hanging just below the ears,—by many called deaf-ears. They vary in color, being red, white, blue, and cream-colored.

Face.—The bare skin around the eye.

Flights.—The primary feathers of the wings used in flying, but tucked under the wings, out of sight, when at rest.

Fluff.—Soft, downy feathers about the thighs, chiefly developed in Asiatics.

Furnished.—When a cockerel has obtained his full tail, comb, hackles, etc., he is said to be furnished.

Gills.—This term is often applied to the wattles.

Hackles.—The peculiar, narrow, long feathers on the neck of fowls.

Henny or hen-feathered.—Resembling a hen from the absence of hackles and sickle-feathers, and in plumage generally.

Hock.—The joint between the thigh and shank.

Keel.—A word sometimes used to denote the breast-bone.

Leg.—In a living fowl, this is the scaly part, usually denominated the shank. In a dressed bird the term refers to the joint above.

Leg-feathers.—Feathers growing from the outer sides of the shanks, as in Cochins.

Mossy.—Confused or indistinct marking in the plumage.

Pea-comb.—A triple comb, resembling three small combs in one, the middle being the highest; such, for instance, as may be seen in the illustration on page 476.

Penciling.—Small markings or stripes over a feather. These may run straight across, as in Hamburgs, or in crescent-like form, as in Partridge Cochins.

Poult.—A young turkey.

Primaries.—The flight-feathers of the wings, hidden when the wing is closed, being tucked under the visible wing, composed of the "secondary" feathers. Usually the primaries contain the deepest color belonging to the fowl, except the tail, and great importance is attached to their color by breeders.

Pullet.—A young hen. The term is not properly applicable after a bird is a year old.

Rooster.—An American term for a cock chicken.

Saddle.—The posterior part of the back, reaching to the tail in a cock and answering to the cushion

in a hen,—cushion, however, being restricted to a very considerable development, as in Cochins, while "saddle" may be applied to any breed.

Secondaries.—The quill feathers of the wings which are visible when the wings are folded.

Self-color.—A uniform tint over the feather.

Shaft.—The stem or quill part of a feather.

Shank.—The lower and *scaly* joint of the leg.

Sickles.—The long, curved feathers of a cock's tail,—properly applied only to the top pair, but sometimes used for one or two pairs besides.

Spangling.—The marking produced by a large spot or splash on each feather, differing with that of the ground-color.

Spur.—The sharp defensive weapon on the heel of a cock.

Squirrel-tailed.—The tail projecting in front of a perpendicular line over the back.

Stag.—A term used for a young cock, chiefly used by Game Fanciers.

Station.—An ideal standard for games embodied in *style* and *symmetry.*

Strain.—A race of fowls that has been carefully bred by one breeder, or his successors, for a number of years, and has acquired an individual character of its own.

Symmetry.—Perfection of proportion; often confounded with carriage, but quite distinct, as a bird may be nearly perfect in his proportions and yet "carry" himself awkwardly.

Tail-coverts.—The soft, glossy, curved feathers at the sides of the lower part of the tail, usually of the same color as the tail itself.

Tail-feathers.—The straight and stiff feathers of the tail only; the top pair are sometimes slightly curved, but they are generally, nearly, if not quite, straight, and are contained inside the sickles and tail-coverts.

Thighs.—The joints above the shanks,—the same as the drum-sticks in dressed fowls.

Top-knot.—Same as crest.

Trio.—A cock or cockerel and two hens or pullets.

Under-color.—The color of the plumage seen when the surface has been lifted. It is manifested chiefly in the down seen about the roots of the feathers.

Vulture hock.—Stiff, projecting feathers at the hock-joint. The feathers must be both stiff and projecting to be thus truly called and condemned.

Wattles.—The red, depending structures at each side of the base of the beak, chiefly developed in the male sex.

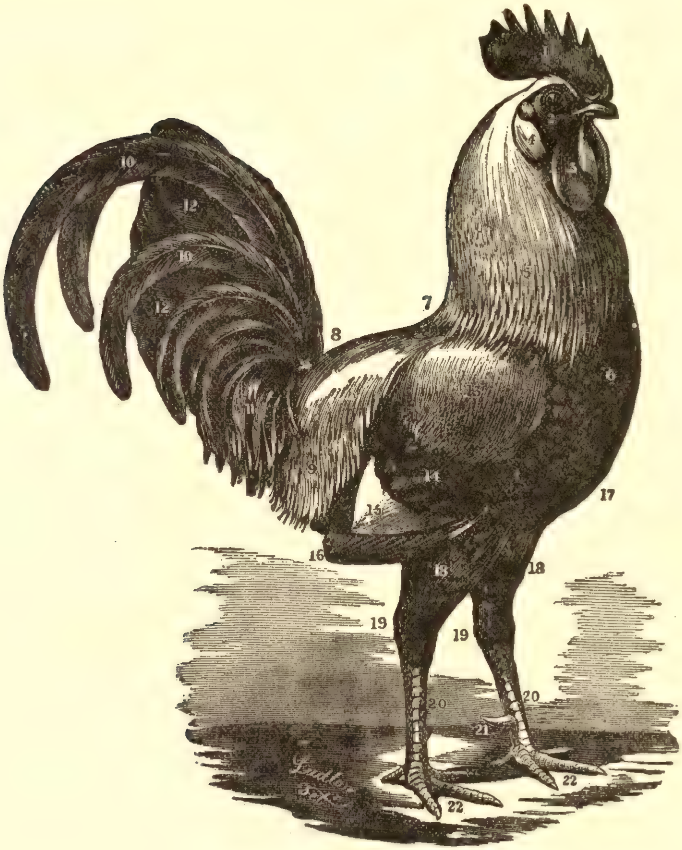
Web.—The web of a feather is the flat or plume portion; the web of the feet, the flat skin between the toes; of the wings, the triangular skin seen when the wings are extended.

Wing-bars.—Any line of dark color across the middle of the wings, caused by the color or marking of the feathers known as the lower wing-coverts.

Wing-bows.—The upper or shoulder part of the wings.

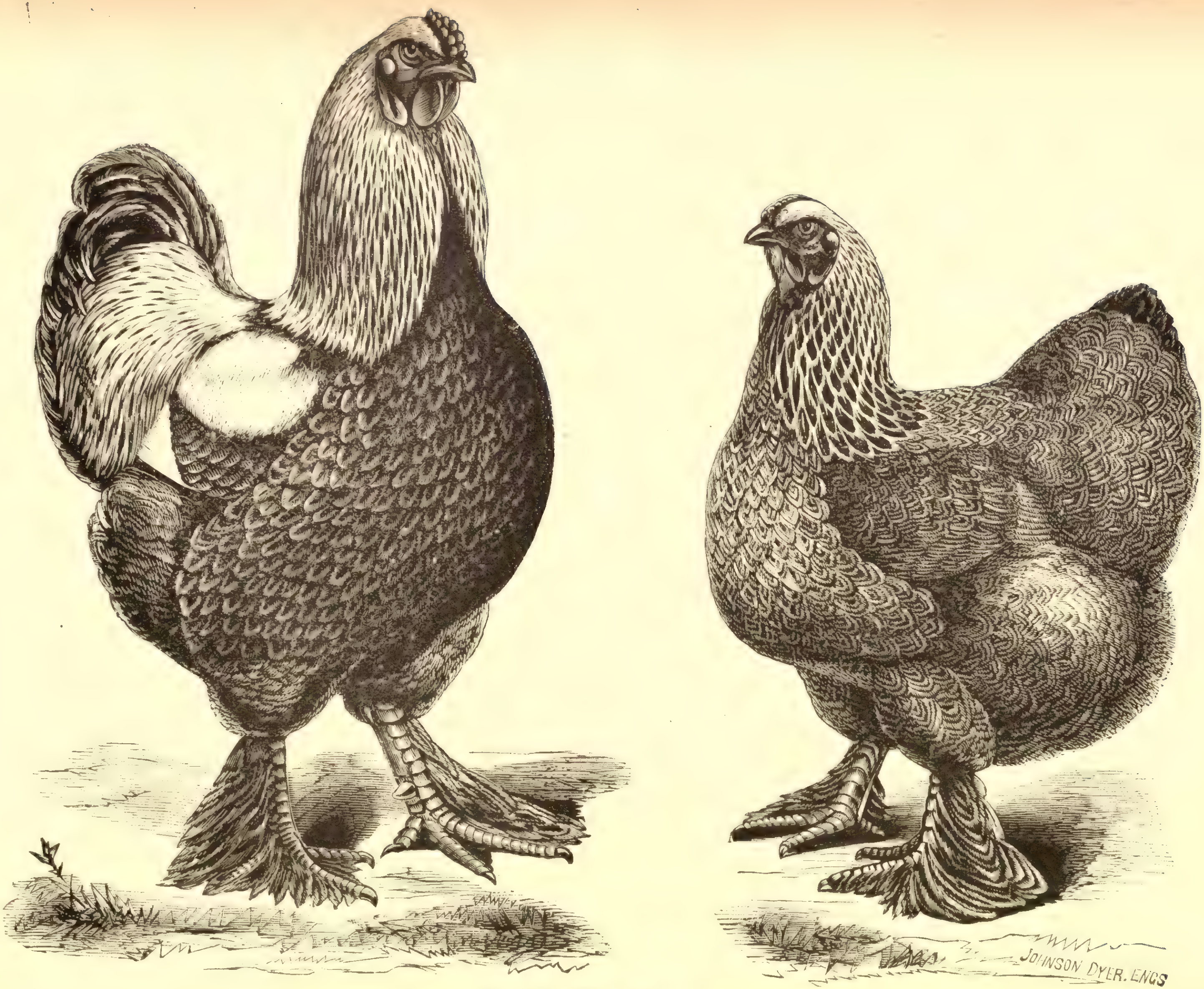
Wing-points or Wing-butts.—The ends of the primaries.

Wing-coverts.—The broad feathers covering the roots of the secondary quills.



TECHNICAL TERMS.

1. Comb.
2. Face.
3. Wattles.
4. Deaf-ear or Ear-lobes.
5. Hackle.
6. Breast.
7. Back.
8. Saddle.
9. Saddle-hackles.
10. Sickles.
11. Tail-coverts.
12. True Tail-feathers.
13. Wing-bow.
14. Wing-coverts, forming the "bar."
15. Secondaries, lower ends forming the wing or lower butts.
16. Primaries, or Flights, not seen when wing is clipped up.
17. Point of Breast-bone.
18. Thighs.
19. Hocks.
20. Legs or Shanks.
21. Spur.
22. Toes or Claws.



DARK BRAHMAS.
Bred by Geo. P. Burnham, Melrose, Mass.

BRAHMAS.

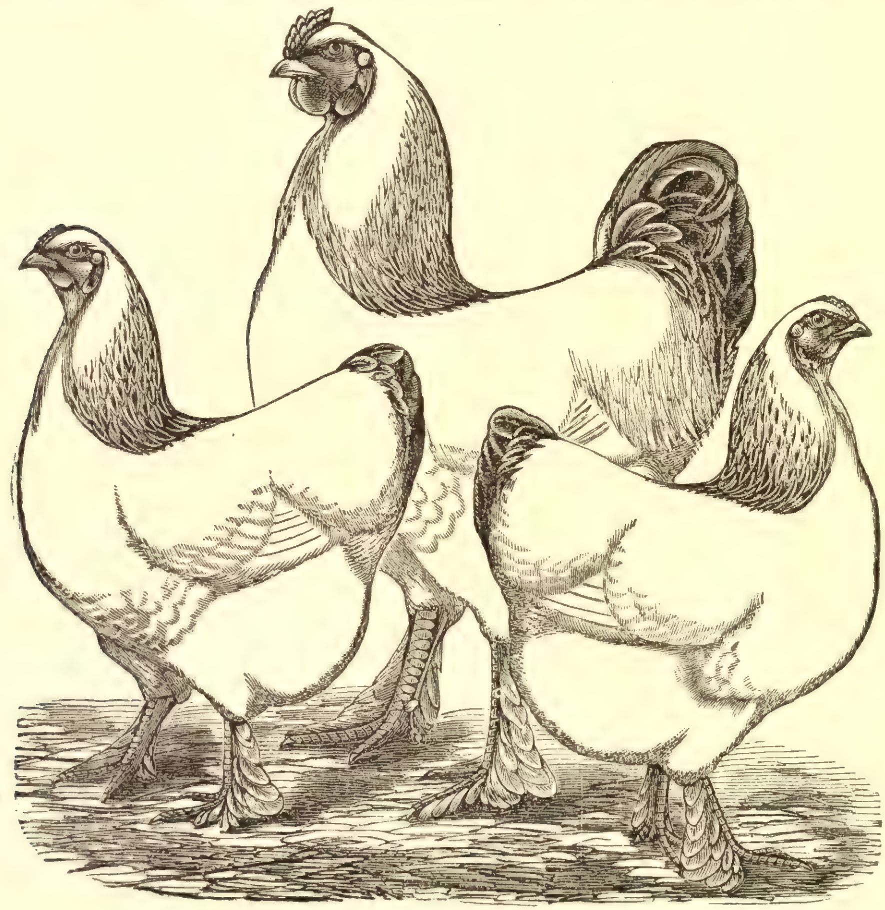
BRAHMA fowls, sometimes formerly called Brahma Pootras, have within a few years past become very popular, and are now regarded as one of the most desirable of the many favorite breeds; in fact, we know of no breed that is better adapted to the general poultry keeper's use, or that is regarded with more favor, their gentle disposition, quiet habits, laying qualities, as well as the fine quality of meat which they furnish for the table, placing them in the first ranks of the valuable poultry breeds. There has been quite an extended controversy among breeders respecting the origin of the Brahma, some holding to the opinion that this breed originated in a cross with the Cochin, others that it is entitled to rank as a distinct variety from Northern India. The argument in favor of the former, being the large size of the fowl, feathered legs, color of eggs, and formation of skull, while the adherents to the latter opinion have the strong argument in the unique and exceedingly peculiar comb, so entirely different from that of other breeds, the color, prominent breast-bone, different disposition and habits generally, together with the authority of the most eminent breeders in their favor. We quote the following description of the Brahma from Wright's Practical Poultry Keeper, a well-known authority on both continents:—

"Their most marked peculiarity is the comb, which is totally different from that of any other variety. It resembles *three* combs pressed into one. In a first-class cock, the effect is such as would be produced were a little comb, about a quarter of an inch in height, laid close to each side of his own proper comb, twice as high, the center one being thus higher than the others. Each division of the comb ought to be *straight* and even, irregular or twisted combs being serious faults in a show pen. In the hens the comb is very small, but the triple character should be equally evident, and the formation is quite plain, even when the chicks first break the shell.

"There are two varieties of Brahmas exhibited, known as "Light," and "Dark" or "Penciled" Brahmas; and on no account should they be crossed, the result being, according to Mr. Teebay, who was formerly the most successful and extensive breeder of Brahmas in England, always unsatisfactory. The cross may be known, if the birds profess to be "dark," by the lighter, gayer appearance of the cock's breast, perhaps accompanied with large white splashes, and sandy colored or brownish patches about the pullets; this, however, must not be confounded with the brownish tinge which nearly all dark Brahma hens acquire with age. Should the fowls be offered as light Brahmas, the pullets will have buff, yellowish, or sandy backs and wings, and the cocks most likely yellowish hackles."

The Brahma, like all the Asiatic breeds, is of large size, yet unlike the Shanghai and Chittagong, the meat is of fine texture and delicate flavor, though not quite equal to the Dorkings in this respect. It seems to have taken the place of those old-fashioned breeds, once so popular, possessing all their good qualities, and rejecting the objectionable ones, except it may be an inclination to sit oftener than some varieties, but even this tendency differs greatly with different individuals. The writer had one fine Brahma hen in a flock of ten the past year, that commenced laying when a pullet of six months, and continued to do so with slight exceptions through the winter, spring, and summer, never inclining to sit even once during the year; this is an exceptional case, however. As to size of this variety, the cocks have been known to attain the weight of eighteen pounds, and hens thirteen pounds, and we occasionally hear of their turning the scales at even higher figures than these, but such instances of weight are very rare; even sixteen pounds is regarded as an unusual weight for a cock, and nine to eleven pounds for a hen is a good average weight. Cocks not weighing nine pounds, and hens not weighing seven and a half pounds are disqualified from prize exhibitions, according to the American poultry standard. Though of large size, Brahmas are not ungainly or awkward, like some of the other large breeds, but on the contrary, very graceful in form and movement.

Light Brahmas. The Light Brahma is generally larger, on the average, than the Dark of this breed. The color of the plumage is mostly white, but shows, when parted, a tinge of bluish gray toward the skin. The neck hackles are distinctly striped with black down the center of each feather, terminating to a point at the extremity, though in the cock the plumage of the neck is lighter than that of the hen, the upper portion being white, and the lower two-thirds marked as above described, the hackle reaching well over the shoulder in both cases. The neck is medium in length and well arched, though that of the cock longer in proportion than that of the hen. The back of each should be white in color, broad, and flat between the shoulders. The wings are small, and appear white when folded; but the primary feathers, being closely folded under the secondaries, are black, generally, though sometimes



LIGHT BRAHMAS.
Bred by George P. Burnham, Melrose, Mass.

edged a little with white. The secondary feathers of the wings are white on the outer web, and black on the inner web, being one-half black, and one-half white. The body is deep, and round at the sides, the breast full and broad. The tail is black in both sexes, and rather short, though spreading. The tail of the cock is full, carried rather upright, and well filled underneath with curling feathers. The sickle feathers are rather short; coverts show beautiful green reflections, and quite glossy. This fowl has a broad appearance behind, owing to the abundance of fine downy feathers, denominated "fluff," and which is developed so profusely in the Asiatic breeds. The legs of the pure breed are of medium length, with a reddish-yellow tinge on the inside, and well

covered with white feathers, or white mottled with black, the feathers covering the outer toes to the extremity. The head is broad, projecting over the eyes, with white plumage; the eyes large and bright; comb quite low, and is what is called "the pea comb," resembling three small combs pressed into one, the middle one being a little the highest; the peculiarity of this comb is discernible even when the little chicks first break the shell. The color of the comb is bright red; the ear-lobes and wattles are also of the same color. The beak is short and stout, and generally yellow, with a dark stripe down the upper mandible, giving it in some cases the hue of dark horn.

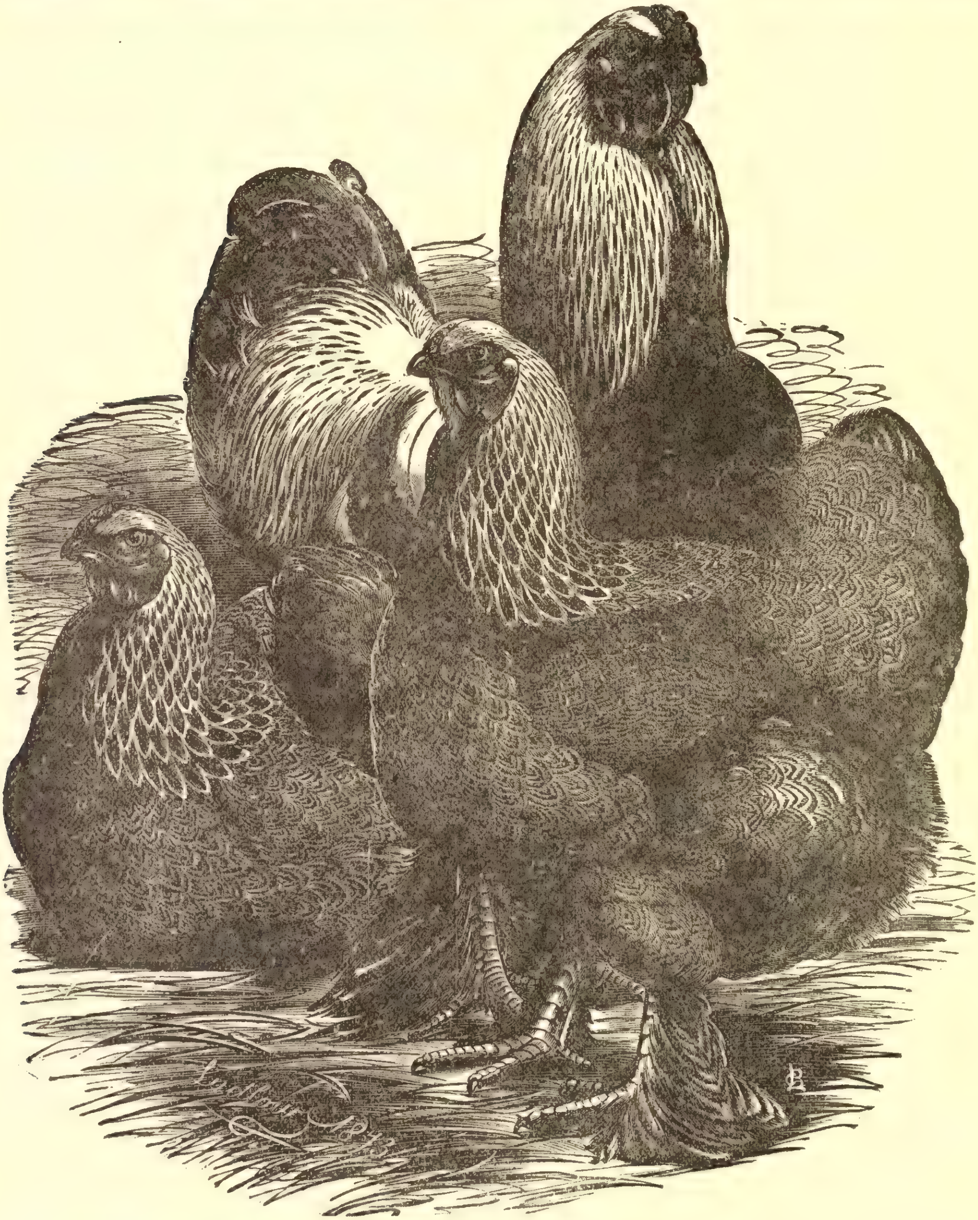
This variety seems to be more generally popular than the Dark, though they are equally valuable in most of the good requisites, and many prefer the latter as a matter of taste as to color of plumage. For our own part, we prefer the Light variety, as being more attractive in color they make such a striking contrast with the bright green of a lawn, and always have such a neat, attractive appearance. Most poultrymen consider them the better layers, the year through, than the Dark, though the latter are considered remarkably good layers, generally, and take rank among the best in this respect. Those who have had an extended experience in breeding this variety have given certain facts, the result of their experiments and observation, which may be of great benefit to those just commencing the undertaking. Chickens of this breed, when hatched very early in confinement, or with limited range, will often show very undesirable plumage during the first three months; but if they are allowed an extended range, where they can obtain plenty of fresh grass, they will improve wonderfully in plumage, even after five or six months old. Insect food and fresh grass are indispensable to the perfect development of the adult plumage. Therefore, do not pronounce a Light Brahma chick as worthless, as to color, because he has not a pure white back, or has a neck too white or too black, according to the proper standard of merit; with proper food and range they will generally come out "all right" in these respects, with the adult feathering, which might very properly be called their "new winter clothes." The dark beak in chicks of this age is indicative of a dark striped hackle in adult feathers, while the light or slightly colored beak indicates a light stripe in hackle feathers in full development. Vulture hocks, which are stiff projecting feathers at the hock-joint (or the joint between the thigh and shank), are considered a very great defect, and such birds should not be used for breeding purposes, but be carefully excluded from the pen. Mr. G. P. Burnham, who has been a breeder of Brahmas for about thirty years, says of them :—

"The Brahmas are among the largest average fowls now known in the world. They are excellent layers of large-sized eggs, and when well-fed and properly cared for, come early to maturity. The meat is fine-grained, and six to eight-months-old cockerels make superior fall roasters for table consumption. They are a quiet, domestic race, the chickens are very hardy, and after shedding their first feathers and putting forth their winter plumage, they are deemed among the prettiest birds we have in our poultry yards. They are, however, generous feeders, and will eat a third more than ordinary fowls, when kept in close runs. They are nevertheless good foragers — when allowed unlimited range — and so may be kept in good condition on much less provender during the summer and fall months, when permitted to run at large."

Dark Brahmas. — The Dark or Penciled Brahma is similar to the Light in comb, form, symmetry, etc., but quite different in color. The head of the perfect Brahma cock is always quite broad, projecting over the eyes, and surmounted by a good pea comb, which resembles three small combs running parallel the length of the head, the middle one slightly the highest, but all evenly serrated and straight, the whole low and set firmly on the head. The beak is strong, well curved, and the color of dark horn. The eyes, like those of the Light variety, are large and bright. The color of the head plumage is silvery white. The wattles are full, red, and well rounded; the ear lobes are also brilliant red, and about equal in length with the wattles. The neck is rather short, but well curved, with very full hackle,

which is silvery white striped with black, and flows well over the back and sides of the breast, the black stripe in the middle of each feather terminating in a point at the extremity.

The back is rather short, broad, and flat between the shoulders, somewhat rising toward the tail, which is rather small compared with the size of the bird, and carried rather upright.



DARK BRAHMAS.
Bred by Charles Gammerdinger, Columbus, Ohio.

The color of the back is silvery white, with dark pencilings corresponding with the outlines of the feathers; that of the tail is black; the larger coverts, a lustrous greenish black; the smaller or lesser coverts of the same hue, or greenish black edged with white. The saddle feathers are white striped with black, as in the neck, and the larger they are, the more beautiful the bird.

The breast of the perfectly marked cock will be either black, or black with each feather slightly and evenly mottled with white, but on no account should there be *splashes* of white, or *uneven* markings. It should be well carried forward, full, broad, and deep. The body, like the light variety, is broad and deep, the under part of which is black in plumage. The wings are small and well folded up under the saddle feathers and thigh fluff. A good sharply defined black bar across the wing is considered by good judges of this variety, very important.

The primary feathers are black, or black with a narrow border of white on the outer web; the secondary feathers are white on the outer web, and black on the inner, with a dark spot at the end of each feather. The fluff on the thighs and hinder part is very abundant and soft, and should be black or very dark grey.

The thighs are large and well covered with nice soft feathers, either black or black slightly mottled with white, which gives them the color of dark grey; the legs yellow and well feathered on the outside to the ends of the outer toes. The feathers of the legs are black, or black and white.

The color of the hen, except head, neck, and tail, is the same all over the body, each feather having a grayish-white ground with very dark pencilings corresponding to the outlines of the feather. "The penciling on the throat and breast," says an extensive writer on this subject, "is very important, and is one of the first points looked at in a prize hen." The legs of the hen are rather short and thick, and profusely feathered on the outside,—the feathers being the same color as those of the body. They are docile and gentle in disposition, quiet in habits, and do not suffer as much as other varieties do when they are confined.

The plumage being so distinctly and uniformly marked with black or dark pencilings, is very beautiful, and is thought by many to be more attractive than that of the Light Brahma, while the color being darker, would not attract the attention of their natural enemies,—the hawks, rats, cats, etc.; besides the plumage is not so easily soiled as the light variety, which in the confined pens of cities and villages, often become so dingy and begrimed with soot or dust, as to detract much from their original beauty.

A choice between the two varieties is mostly based upon taste as to color, since their intrinsic merits and economic value are about equal. They are a little more difficult to breed true to color than the light variety, though this with many would not be deemed a serious objection; they also do not average quite so large in size as the latter. We find with breeders generally who have bred both varieties, that the point of preference lies with that variety in which they have had the larger experience, and therefore the better acquaintance (aside from the question of color), since the Brahma breed has so many excellences, and so few defects that the better it is known, the more it is valued. Our own preference would be the light variety.

Merits and Defects of Brahmas.—As has been previously stated, Brahmas are of a gentle disposition, quiet in their habits, and thus easily kept within a limited enclosure, if necessary, which makes them a very desirable breed for farmers who do not wish their poultry to have a free range of their farm, also for those living in a village or city, where a limited space is absolutely necessary, since a fence three feet high will keep them enclosed, where one five times as high would be necessary to confine some breeds; besides they are almost harmless as scratchers compared with the Leghorn and some other breeds. They also make very good mothers, though care should be taken in hatching that the hen does not step on the young chickens and injure or kill them in this way, as her great size and weight would render her liable to such accidents, if she were disturbed.

The writer has at the present time pure-blooded Brahmas, and a cross between this breed and the white Leghorn, and while the former fully merit the good things we have said respecting them, the latter seem to inherit the objectionable traits of the Leghorn, viz.:

rambling, flying, and scratching, and, being more pestless in disposition, do not make as good, careful mothers as the former.

The Brahma pullets frequently lay when six months old, and usually lay from thirty to forty eggs before sitting. We have known instances where the pullets began laying in the fall and did not stop until the time of moulting, though this is not usually the case; individuals differ in some respects, but as a breed, they are among the best layers known; as winter layers they have no superiors. One writer says (writing at the last of November),—that he has a hen which has laid forty-five eggs during the last forty-eight days, while others of his Brahma flock are but little inferior to this.

Brahmas are very hardy and grow uncommonly fast: they are therefore desirable for table use. They have an abundance of breast meat, and the meat generally is of fine texture and flavor, though the Dorking is considered, by common consent, to be a little superior to all others in this respect, yet the Brahma ranks very high. On the whole, we know of no fowl that we could recommend with more certainty of success and satisfaction than the Brahma.

COCHINS.

NO breed of poultry has ever attracted so much attention, or such high prices for so long a time as the Cochins, on their introduction to this country. They were introduced from China about the year 1847 or 48, and created a great sensation at the time, which has been humorously termed the "*poultry mania*," or "*hen fever.*" So great was the desire to possess them, that fabulous prices were paid. In England, a hundred guineas was often paid for a single cock, and equally high prices in this country. A reaction must of necessity follow, as a natural result, and the breed is not now as fully appreciated as it deserves, for it possesses really great merit. It is in the main, now superseded by those of greater merit, the Brahmas. The mania attending its introduction, however, absurd as it was, resulted in great benefit by awakening a general interest in the whole poultry subject, which has never since died out. They come next to the Brahmas in size.

The cock will weigh ten or twelve pounds, and sometimes will reach even fourteen when three or four years of age; the hen from eight to ten pounds. The principal varieties of this breed are Buff, Black, White, Partridge, Pea-Combed Partridge, and Silky Cochin or Emu Fowl. They are of gentle disposition, more hardy than any other breed, except Brahmas, grow fast, and are prolific layers, especially in winter, bearing confinement well. They cannot fly, consequently can easily be kept within a limited enclosure. The chickens feather rather slowly.

Buff Cochins.—The Buff Cochin is one of the most popular varieties of this breed. Its color, as the name indicates, is a clear, uniform buff, sometimes light in shade, and often deeper, the deep buff being considered the most desirable in color. Black penciling in the hackle is considered very objectionable, and a disqualification at a poultry exhibition, but we often find birds with a little marking of darker shade well defined about the neck, where it is not considered decidedly a grave fault, though the greater the uniformity of shade, the better. The hackles of the cock, back, wing coverts, and saddle feathers, are generally a rich gold color. The hackle flows well over the back and shoulders. The tail, which is nearly concealed by the cushion in the hen, is quite small, and usually buff in color; that of the cock is also small, short, and full, and not carried very erect; the most desirable color of the tail, is a rich, dark chestnut, or bronze-tinted chestnut mixed with black, though the less black

BLACK COCHINS.
Bred by A. E. Smith, Cherry Valley, Mass.

there is in the tail of either sex, the better. The wings are very small, which renders flying impossible, while the breast is deep, broad, and full, and the body broad and deep; the back broad and rising from the middle towards the tail. The fluff is very abundant, the quality of which is considered a good test of the breeding; if fine and downy, the bird is considered well bred; if coarse and rank, the reverse. The thighs are very large and strong, and abundantly supplied with fluff, giving the birds a very broad appearance.

The legs are yellow, and heavily covered with buff feathers to the ends of the outer and middle toes; they are short and set wide apart; the neck short and well curved; this, with the broadness of the back, and the wings and tail being small, has a tendency to give the bird rather a clumsy appearance, though the carriage of the cock is upright and stately in the extreme. The hen has a very matronly appearance. The head of both sexes is rather small comparatively for the size of the body; the comb red, single, straight, and evenly serrated; wattles and ear lobes red, the latter quite large and pendant, though of fine, firm texture; the beak is yellow. The eyes are bright and sprightly, often approaching the color of the plumage. They are withal, a very handsome, domestic, and docile bird, and quite popular with many of our extensive breeders, as the many fine specimens at our poultry exhibitions attest.

Black Cochins. — This variety are not bred as extensively as the Buff, Partridge, and White Cochins, owing to the fact of its being more difficult to retain the color free from stain, as white or gray under feathers are quite liable to make their appearance. They are quite liable to appear also in old birds that have previously been a jet black color. A golden or reddish tinge about the neck is also quite objectionable. The color should be a rich, glossy black. The eyes are bright, and dark red; the beak yellow, shaded with black, giving it the color of horn. The legs are also yellow, shaded with black, often nearly black, and feathered down the outside with jet black feathers, the outer and middle toes being also well feathered. The tail feathers of the cock have a beautiful metallic lustre. In all respects, except color of plumage, eyes, legs, and beak, they are similar to the Buff Cochins previously described.

White Cochins. — This variety is very neat in appearance when bred true to color, which should be a pure white, avoiding as far as possible the yellow or gray tinge in plumage. They are not, however, bred as extensively as the Buff and Partridge Cochins, as their plumage is more liable to become dingy and soiled with dust and soot when confined to a limited enclosure, which detracts much from their beauty. If, however, they have a large, clean run, with plenty of range, this objection is in a great measure avoided, for, as we have previously stated, they are a very neat, attractive bird.

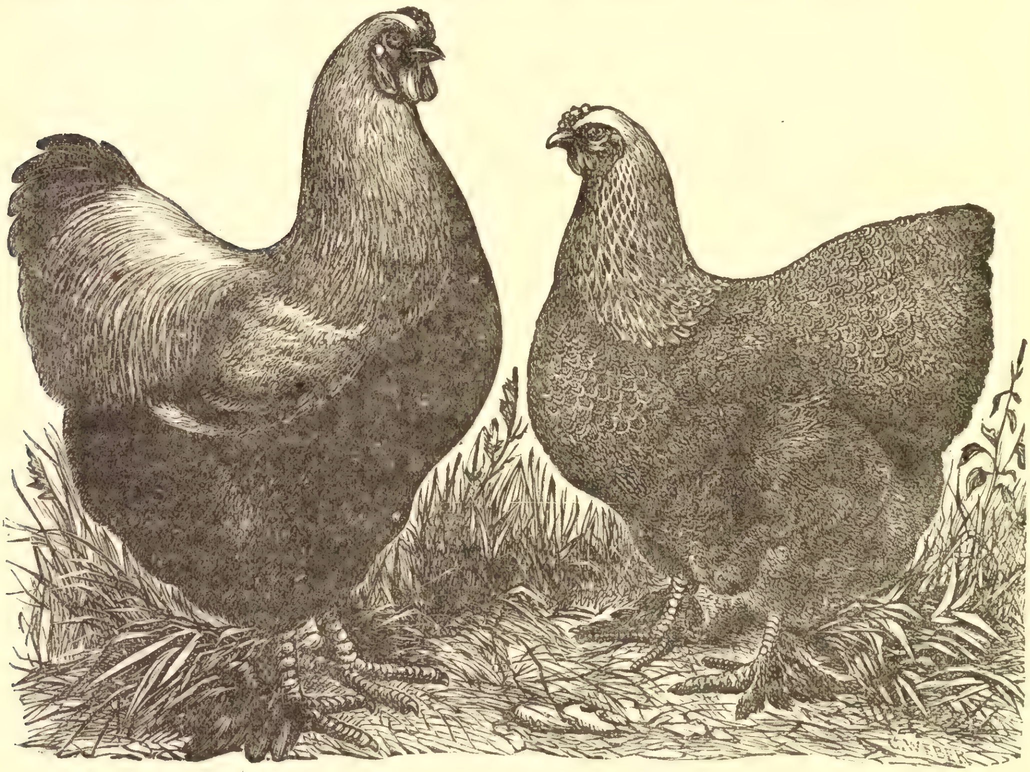
The beak of this fowl is short, stout, and well curved, and of a rich yellow color. The eyes, pearl color or bright red. Aside from the color of the eyes and plumage, our description of Buff Cochins will answer the description of this variety, thus obviating the necessity of frequent repetitions.

Partridge Cochins.—These with the Buff variety, are the most popular of the Cochin breed, and have been, within a few years, gradually gaining in popular favor, as they present a very attractive appearance with their bright plumage and substantial form, while the aristocratic and stately carriage of the cock, combined with the motherly and contented bearing of the hen, their docile disposition and quiet habits, cannot fail to attract the attention and admiration of those who do not consider themselves bird-fanciers, or critics in this respect.

We can give no better description in a condensed form, than that given by Mr. Wright, whose works on poultry are so well known to the general public: "The cock should be a rich orange-red color about the head and hackle, the latter being striped with black; a black stripe

running down the middle of each feather. The saddle feathers are similar to the hackle. The back, shoulder-coverts, and wing-bows, are of a richer and darker shade. The breast, thighs, under part of the body and tail should be a rich black. The hen has a hackle of rich gold color striped down the middle with black; the remainder of the plumage being light brown, penciled with a darker shade of brown."

The plumage is very rich and elegant, the pencilings of brown heightening the beauty to those who have an eye suited to the harmony in color. The tail feathers of both cock and hen are mainly black with a greenish lustre; sometimes the lesser coverts will be edged a little with red. The legs and skin, like all the Cochin varieties, are yellow. The size, form, and general appearance are similar to those of the Buff Cochin, for description of which the reader will there find one sufficiently definite for all practical purposes.



PEA-COMBED PARTRIDGE COCHINS.

Pea-Combed Partridge Cochins.—This variety is quite similar to the Partridge Cochins previously described, with the exception of the comb, which in the one case is single with regular and well defined serrations, while with this variety it is very peculiar, resembling three small combs pressed into one at the base, the middle one being a little the highest, the whole being rather low on the head and slanting erect; that of the hen being quite small. This variety is not quite as much inclined to sit as some of the others, the Buffs, for instance. There is an advantage also in the double comb over the single, in our northern climate, since it is less liable to freeze.

Mr. G. P. Burnham, the illustration of whose fowls of this variety we insert, says of this breed, "They are a very prolific race, the hens proving extraordinary winter layers."

Silky Cochins or Emu Fowls.—Cochins possessing a peculiarly silky plumage, similar to the Silkies, which are hereafter described in this department, are called Silky

Cochins or "Emu" fowls. The entire plumage is of a flossy character, and seems to be an occasional sport from the common Cochin fowl. In every other respect they are like the ordinary Cochin breed. These accidents or freaks of nature are said to be more frequent in the Buff variety than any other. They are generally smaller than the ordinary Cochin, though the fluffy character of their plumage makes them seem equal to the others in size.

They are not as hardy as the others, and do not possess sufficient merit to make them profitable to perpetuate, as a distinct breed.

Merits and Defects of Cochins.—Cochins are good layers, especially in winter, when eggs are most scarce. They make excellent, careful mothers, and in this respect are unsurpassed, though perhaps the Brahmas are fully their equals. When keeping a non-sitting breed, it is always well to keep a few Cochin or Brahma hens to perform maternal duties, and where successive sittings are desired, we know of none better than this breed. The chickens feather slowly, but are very hardy, more so than any other breed, except the Brahmas; they grow rapidly, and are early ready for market or table use. They fatten easily and are not as particular as to choice of food as some breeds. In consequence of their fattening propensities, therefore, care should be taken not to feed them too much on corn exclusive of other kinds of food when laying, as it will have a tendency to impede and often stop this function entirely for a time, on account of the superabundance of fat deposits, and will even sometimes cause death.

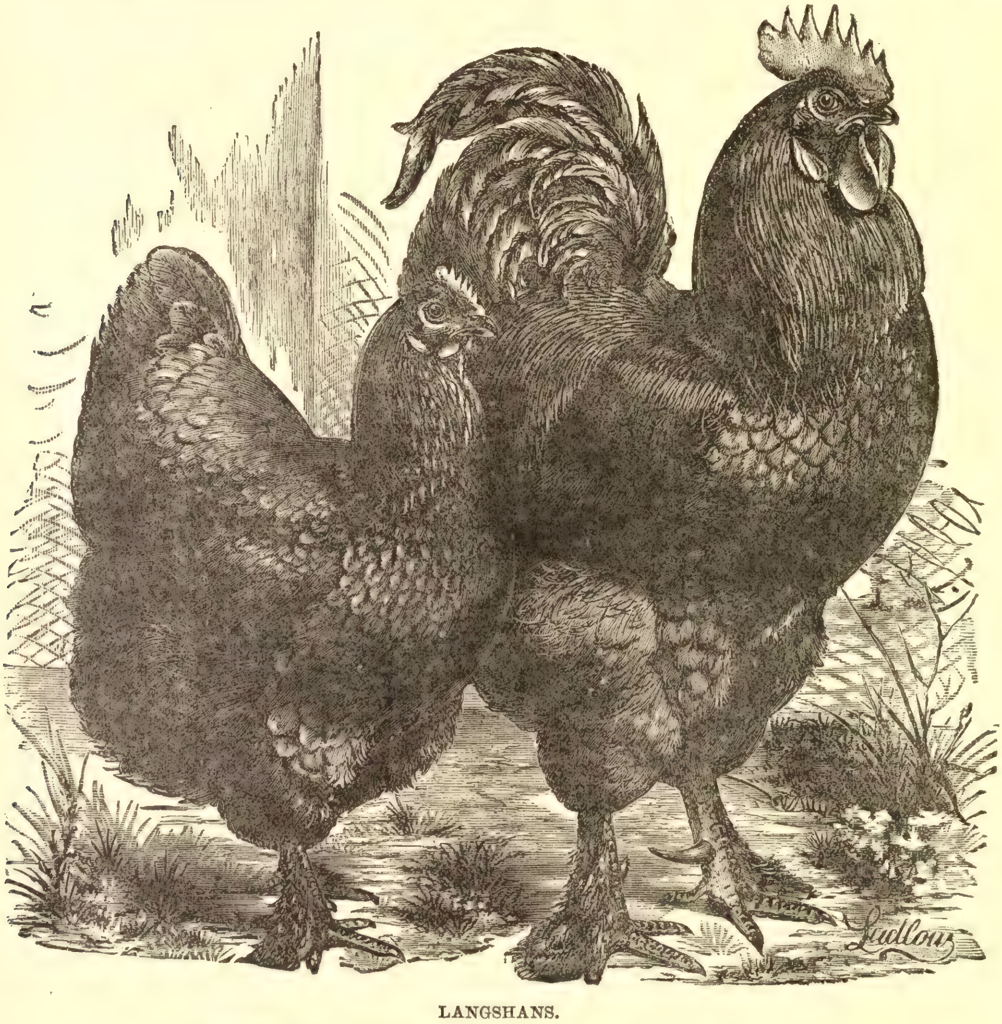
They are extremely docile in disposition, quiet, and we might add, lazy in their habits; are naturally gentle and tame, consequently easily domesticated, and very peaceable; seldom quarreling. They are very large and heavy, and as their wings are proportionately small, they cannot fly, therefore a fence two feet high will effectually keep them within bounds, while their quiet habits have a tendency to prevent their scratching, and they consequently do little damage in this respect, wherever kept, compared with some other breeds. When young, the flesh is quite good, and as they grow rapidly, may be killed when three months old. They bear confinement well, and will thrive where some breeds would droop and die for want of exercise and extended range.

As to their defects: though they make most desirable mothers in all respects, the serious objection is their frequent and persistent inclination to sit; this fever (for it is as much that as anything) generally comes on after every dozen or twenty eggs laid. It requires about three days absence from the nest to break up this propensity for the time. Although this is usually considered an objection, yet when a regular and constant succession of chickens is desired, it becomes a great convenience, as chickens can be hatched with great regularity.

Their flesh is not regarded as equal in quality to that of some other breeds, though as we have before stated, when quite young is quite good. The breast meat is not abundant, which affects its popularity in the market. Cochins are considered valuable for crossing with other breeds, such as the Dorkings or Crèvecoeurs.

LANGSHANS.

THE Langshans are natives of Northern China. Although they were introduced into England in 1872, where they were generally regarded with favor, they have not been much known in this country until within the last four or five years; yet the limited acquaintance we have had with them, and from what our worthy brother across the water—"John Bull,"—says of them also, we have no doubt they will take high rank among our first-class fowls, and prove what they promise,—a valuable acquisition to our poultry breeds. They are large, like all the Asiatic breeds, and somewhat resemble the Black Cochin, though in many respects entirely different; the tail is longer and the comb larger than that of the Cochin; the eggs are also very different from the latter, being specked, or mottled, and they



LANGSHANS.
Owned by Maj. A. C. Croad, Durrington, Worthing, England.

are also a more active fowl than the Cochin. The comb is single and straight, bright red, and deeply and evenly serrated; the head small for the size of the bird, and full over the eye like the Brahma. The plumage is a beautiful greenish black, with metallic reflections. The color of the legs,—which are well feathered on the outside,—is a purplish black, or dark slate, while between the toes and scales it is of a decidedly pink tinge. They are full and deep in body; the breast being broad and carried well forward, as in the Dorking, while the general contour is round and deep like the Brahma. The average weight of cocks is from nine to

ten pounds; that of the hen about eight pounds. A gentleman who has been a successful importer of these birds writes of them as follows: "I first became acquainted with this breed in 1860, when I came across them in Chinese Tartary, and, being an enthusiastic ornithologist, I devoted considerable attention to these 'Turkey fowls,' as the Chinese called them, the natives always asserting in their ignorance that the Langshans were allied to the wild turkey. Subsequently I saw more of these Langshans in the vicinity of Hankow, 600 miles up the Yang-tsze-Kiang River, and it was from these that I brought specimens to England."

The name given them was from the locality in which they were found, which is the northern province of China called Langshan. Major A. C. Croad, of England, who has published a book pertaining to this breed, and is also an extensive importer of these fowls, says of them:—"To begin with the Langshan chick—on emerging from the shell the back is always black, its head, face, and breast a mixture of black, white, and different shades of canary. These shades are by no means distributed according to rule, but anyone seeing a brood of Langshans would at once pronounce them to be of one family. I have bred an immense number of these birds, and any variation from what I have stated I have always been able to trace to a cross. The young birds often retain white nest feathers until they approach maturity, and here and there a cockerel sports red or golden feathers, which are repeated with every moult. These (I suppose I must call them imperfect specimens) are often wondrously handsome, the colored feathers having all the sheen peculiar to the black. I have found that from a cock with these imperfect markings you are just as likely to breed black chickens. The face, wattles, and ear-lobes are a bright red color, neck long and full, back short and broad, rump high, tail very full and flowing with long sickles; the eyes and beak are dark; black-penciled legs. The hue of the leg I consider a most essential point, for I have never found it to vary. The leg feathering, on the contrary, varies considerably. My imported specimens (with two exceptions that were without) have been what I should consider well-feathered. The plumage is glossy black, very brilliant, lustrous and sheeny. One great argument in favor of their being a pure, distinct breed is, that as a rule they come so true to color and style. They are excellent layers through summer and winter alike, and as table fowls are not to be surpassed, for combined with great bulk is the thin skin, white flesh of fine texture and delicate flavor."

We are indebted to the courtesy of Mrs. R. W. Sargent, Kittery, Me., the importing agent of Maj. Croad in the United States, for the fine representation of this breed.

Merits and Defects of Langshans.—The Langshans, being natives of Northern China, are easily acclimated to our country, and extremely hardy, withstanding readily the severest weather. Being of large size, with white flesh and skin, they make an excellent table fowl, more especially on account of the delicacy of flavor which the flesh possesses. They lay large, rich eggs the year round, are good winter layers, while they are less inclined to be troublesome as incubators, since they lack that intense desire to sit that is characteristic of the Cochin and most Asiatic breeds. Their bearing is quite aristocratic and proud. Any tendency towards vulture hocks or russet tinge in plumage is very objectionable, and such birds should be discarded from the breeding pens.

LEGHORNS.

LEGHORNS are natives of Italy, and consequently arrive at the greatest perfection in a southern climate, but as they have become well acclimated to our country, they thrive well in all parts, and suffer no detriment from our cold winters, except occasional disfigurement of combs and wattles, which being large, and the comb also single, will sometimes become frost bitten in our coldest weather north, unless well protected by a warm, comfortable house. They are very hardy, and less liable to the diseases common to poultry than almost any other variety.

They are very desirable as egg producers, and this is their crowning merit; they are non-sitters, consequently when keeping this variety, it will be necessary to keep a few hens of some other breed, Brahmas or Cochins, for instance, to perform the maternal duties of the hen establishment. They are persistent layers nearly all the year round, if given warm winter quarters (which every fowl ought to have), and well cared for otherwise. They require a free and extended range, are great foragers, and will thrive well with ordinary care if given unlimited range, and plenty of fresh, cool water.

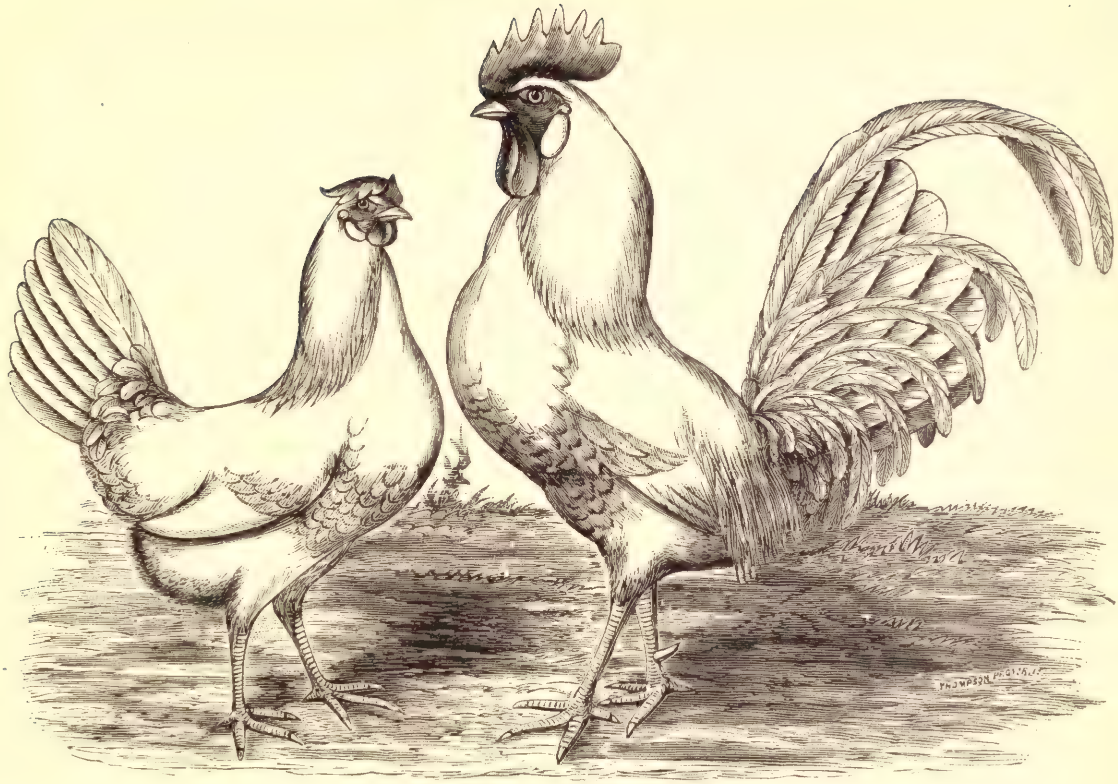
They mature early; the cockerels often crow at six weeks of age, and pullets have been known to lay at four and a half months. The eggs are pure white, and large, compared with the size of the fowl. The average weight of the cock is from 4½ to 6 pounds, that of hens from 3½ to 4 pounds. This breed is quite popular at present, both in this country and Europe, and where eggs are mainly the desideratum, and there is plenty of range, we know of no more profitable fowl to keep. Though their flesh is of good quality, their small size would not recommend them as a table fowl, their chief excellence, as we have before stated, being that of egg production. A new variety of this breed has been recently introduced, having rose combs, which will have a tendency to do away with their chief objection in extreme cold climates, viz., large combs.

The varieties of this popular breed of fowls are Black, Brown, Dominique, White, and Rose-Combed White, though the most common are the Brown and White varieties.

Brown Leghorns.—This is one of the most popular varieties of the Leghorn breed, their beautiful plumage making them very attractive, aside from their great merits in a more practical point of view. The color of the head is a dark, reddish brown, approaching a bay, which shades into a lighter hue on the neck of the cock, and becomes a rich golden bay, striped with black, on the hackles. The plumage of the back is very dark red or nearly black, each feather being striped with a golden bay, which gives it a very rich appearance. The breast shades to a black on the under part, while the wings are a blending of dark red and golden bay with coverts of a greenish black, which are quite lustrous, forming a definite bar across the wings; the tail is carried rather upright, is large for the size of the fowl, and quite full, being of a rich black with lustrous green reflections, which, with his proud, aristocratic bearing, makes him quite an attractive object.

The neck of the hen is a yellowish brown striped with black, each feather being striped with black down the middle. The general color of her body is dark brown, finely penciled with light brown; her tail black, with occasional slight pencilings of brown. The comb is bright red, single, deeply and evenly serrated, and quite large for the size of the fowl; that of the cock usually stands upright, being broader at the base, while that of the hen usually falls over a little to one side at the top, as represented in the cut of these fowls.

The ear-lobes are white, or nearly so; the wattles, like the comb, are bright red, quite long and thin, and swing with every motion of the head. The legs are bright yellow, while the feet are the same color, with a very delicately marked dark stripe down each toe. The



WHITE LEGHORNS.
Bred by Samuel Cushman, Pawtucket, R. I.

ROSE-COMBED WHITE LEGHORNS.
Bred by N. D. Forbes, New Haven, Conn.

eyes are bright and full, and the manner sprightly. Like all the varieties of the Leghorn breed, they are more restless and nervous than many other kinds, and will forage extensively when given the opportunity, which makes them very desirable for those farmers who have a wide range and do not object to poultry having free access to it.

They are very hardy and easily reared; being of small size, they require less food than some of the larger varieties, while they also mature earlier. They are bountiful layers, and are unsurpassed in this respect; the egg is pure white. Their color is such that it draws more heat from the sun's rays in winter than the white fowl, which some of the poultry fanciers, having a partiality to this variety of the breed, give as an argument in favor of brown over the white plumaged fowls, but for our own part we see but little choice in the two varieties. It is merely a matter of taste. There is no fowl that looks more neat than the white—*when kept neat*,—and they are a very attractive feature to a green landscape.

White Leghorns.—The White Leghorns were introduced into this country much earlier than the brown, and are consequently more widely disseminated. In England they are much more popular than the Brown variety, while in this country they seem to be regarded with nearly equal favor, with perhaps a little partiality in favor of the brown. As far as the economic value of the two colors is considered, we regard them as of equal value; the color being a matter of taste. Some fanciers consider the brown chickens more hardy than the white, while those with whom the white variety are the especial favorites, regard them as equally hardy with the brown. They are more easily bred true to color than the brown variety, as white feathers will unavoidably make their appearance now and then to disappoint the fancy breeders of the brown. For farm use, as egg-producers, or as poultry for the table, this is no essential objection; but to the bird fancier who is breeding for the show-pen, according to the recognized standard, it is an obstacle to be met in breeding birds of the purest blood.

It is only to be met by eliminating from the breeding pens, as often as they make their appearance, every bird with foul feathers, and retaining only those for breeding purposes that are true to color.

The White Leghorn is in plumage pure white throughout, with bright red comb and wattles, and white or creamy white ear-lobes. Its beak and legs are yellow. In the cock the hackle is very abundant, also tail coverts; while, like all the Leghorn varieties, the sickle-feathers are long and well curved. They are proud in carriage, and, like all the smaller varieties of fowl, are sprightly and active. They are a beautiful fowl in form, plumage, and symmetry, and well repay for the care bestowed in the abundant supply of eggs they furnish. In all respects except plumage they are similar to the Brown Leghorns.

Rose-Comb White Leghorns.—This is a new variety of the Leghorn breed in this country, that seems to do away with the objection so often urged by those living in a cold climate, against the single combs of the Leghorns, which are so liable to become frozen by our Northern winters, and also obviate the dubbing process so often resorted to as a choice between two evils, of "cutting or freezing," and which at best is a cruel practice to prevent a worse evil imposed by Jack frost.

In size, form, symmetry, and all respects except the comb, they are identical with the common White Leghorns.

By careful breeding, we shall doubtless have in time Rose-comb Leghorns of all the varieties of plumage now known. These would be better adapted to our colder latitudes than the single comb varieties. It only remains for the patient, persevering efforts of our experienced poultry breeders to bring it about, which can be done without detracting in the least from the characteristic merits of the breed.

Dominique Leghorns. — This variety has the general form and appearance of the Leghorn breed generally, except the plumage, which is of a light, slaty blue in ground color, with each feather distinctly penciled across with dark bars; the pure-bred fowl will have this uniform color free from white, black, or any other colored feathers. They are not as popular as the Brown and White Leghorns, owing probably to the fact that their plumage is not as pleasing to the eye possessing a fine taste for the beautiful in nature. They are, however, very hardy and good layers, which is the chief merit of the Leghorn breed generally.

Black Leghorns. — These were introduced into this country in the autumn of 1871, by Mr. Reed Watson, of East Windsor Hill, Conn. Subsequently, he made other importations. In 1878, he imported from Italy a fine cock, from which he bred most admirable and rare specimens of this variety.

Their general characteristics are like the other varieties of the Leghorn family, being noted for their laying qualities, vigor, hardiness, ease of raising, and beauty; and are highly valued by those who have raised them continuously. The color of the plumage throughout is a pure, deep black, that of the cock being very rich and glossy. Any approach to a red or brassy tinge in feathers is considered a grave defect. The large, bright red comb and wattles, and white ear lobes, making a pleasing contrast with the rich glossy black of the plumage, render it a very beautiful fowl. The beak is yellow, shaded with black; the legs a yellowish black, being nearly black in front.

Merits and Defects of Leghorns. — The great merit of the Leghorns is, as we have previously stated, their superior laying qualities; in this respect they are unsurpassed. They are also very hardy, being less liable to the common fowl diseases than almost any other breed, and are consequently raised with ease and less care than would be required for many other breeds. They are non-sitters, consequently those who keep them are not troubled with the frequently recurring brooding propensity characteristic of most of the Asiatic varieties. They are great foragers, and this quality, combined with their small size, renders their keeping in summer less expensive than many of the larger and more docile breeds. Their activity with many may be deemed a defect, and such it would be, where confinement was necessary for lack of room, but where there was a range sufficiently extensive for foraging purposes, it would be rather considered a desirable quality.

As to their defects, the size of the comb, as we have previously stated in the description of this breed, is considered objectionable in our cold northern latitude, being so liable to freeze unless protected with warm winter quarters, and which when frozen greatly disfigures them, besides causing considerable suffering; but this would not be considered an objection in our more southerly latitudes, where the winters are more mild.

They are a very active, nervous fowl, consequently need the liberty of an extended range in order to thrive well, and where given the freedom of a farm, are inclined to wander farther than any breed of fowls with which we are acquainted. They are easily frightened, and not sufficiently docile in disposition to be very tame, and bear petting much. They are also very expert in flying over high fences, which renders limitation to their range sometimes a question of grave doubt, unless extra precautions in the height of the fence be given due consideration.

Their small size renders them unprofitable as table fowls merely, and where poultry is the principal desideratum, a larger breed of fowls would be more profitable and desirable; besides, their flesh is liable to be tough when over nine months old. Their eggs are small compared with those of the larger breeds, yet are large compared with the size of their bodies.

Taking all things into consideration, — the merits and defects, — where eggs alone are the main point in question, and there is plenty of room for foraging, as would be the case on most farms, and even in many localities in the towns and villages, we know of no fowl that we could recommend with more surety of giving satisfaction, than the Leghorns.

SILVER-PENCILED HAMBURGS.

HAMBURGS.

THERE are at present several varieties of fowls of the breed called Hamburgs. As to their origin Mr. Wingfield, an English writer, says: "Why Hamburgs should be called by that name is inexplicable, except upon the supposition that the Levant merchants then residing at Hamburg introduced them from Turkey or elsewhere, and that from Hamburg they were exported to England. By a similar transit Black Hamburg grapes derived their name, for they are certainly natives of Spain, imported by Hamburg merchants, and first known to Englishmen as Hamburg grapes because purchased by us there. Whatever may have been its place of origin, or however its present name may have been derived, it would appear that the Hamburg fowls were among the occupants of the poultry-yards of our monasteries as early as the beginning of the fourteenth century, since Chaucer has described a cock in their possession which was evidently of the Golden Hamburg breed."

The general characteristics of this breed of fowls are rather small size, the cock weighing from 4½ to 5½ lbs., and the hen from 3½ to 4½ lbs., beautifully penciled or spangled plumage, bluish legs, and brilliant red rose combs, rather square in front, running close and straight on the head, the top covered with little pointed projections and terminating in a spike behind, inclining slightly upward. Ear lobes white.

Their plumage is elegantly marked, glossy, and very beautiful, which combined with their graceful carriage and fine laying qualities, make them favorites wherever known. On account of the latter named quality they were formerly in England sometimes called "Dutch every day layers."

While this breed is too small to be a profitable table fowl, still the bones are small, giving more meat than could be expected from the size of the fowl, while it is of first-class quality and flavor. Their chief value is in egg production, laying most of the year except when moulting, as they are classed among the non-sitters. They naturally like a wide range, and are erratic in their propensities, yet they may be kept in confinement if strict cleanliness be attended to. We know of no breed that will suffer more from overcrowding and lack of cleanliness than Hamburgs. Six for one shed is quite sufficient in number if confined, and their surroundings should have careful attention.

They are capital winter layers, and though not as hardy, perhaps, as the Leghorn and Game-breed, still they are tolerably so, and will usually thrive well with good care. The principal recognized varieties of this breed are Black, Golden Penciled, Silver Penciled, Golden Spangled, Silver Spangled, and White.

Silver Penciled Hamburgs.—The once popular fowls known as Bolton Grays, are doubtless the ancestors of this breed, which, like those ancestors in the egg-producing qualities, rank among the best of the small active breeds in that respect.

We can give no better description of this beautiful variety of Hamburgs, than that given by Mr. L. Wright, to whose work on poultry we are indebted for the following: "The size of this exquisite breed is small, but the shape of both cock and hen peculiarly graceful and sprightly. Carriage of the cock very conceited, the tail being borne high, and carried in a graceful arch. The comb in this, as in all the other varieties, to be rather square in front, and well peaked behind, full of spikes, and free from hollow in the centre. Ear-lobe pure white, free from red edging. Legs small and blue.

The head, hackle, back, saddle, breast, and thighs of the cock should be white as driven snow. Tail black, glossed with green, the sickle and side feathers having a narrow white edging the whole length, the more even and sharply defined the better. Wings principally white, but the lower wing-coverts marked with black, showing a narrow indistinct bar across

the wing. The secondary quills have also a glossy black spot on the end of each feather, which gives the wing a black edging. The most frequent defect in the cock is a reddish-brown patch on the wing, which is fatal.

We believe this fault to occur nearly always in old birds, and remember seeing a cock which had taken thirty-seven prizes moult out thus at last, and so end his career as an exhibition bird. The bar on the wings is difficult to get, and is not imperative; any cock with a nicely edged tail, and quite free from colored or black markings on any part of the body, ought to stand a fair chance in exhibition, if form and comb be good. As a bird to breed from, however, he would be a failure; as it is impossible to get well-marked pullets except from a cock with a good proportion of black under-color.

The most frequent fault in the hen is a spotted hackle, instead of pure white. The rest of the body should have each feather distinctly marked, or 'penciled' across with bars of black, free from cloudiness, or, as it is called, 'mossing.' The tail feathers should be the same as the body; but to get the quill feathers of the wings so is rare, and a hen thus marked is usually valuable. Their general form is very neat, and appearance remarkably sprightly."

The ground color of the hen is pure silver-white; the back, breast, body, thighs, and tail having every feather evenly barred with black; wings the same, excepting the primaries, which are clear white. Care should be taken in selecting pullets for breeding that the feathers of the tail be plainly penciled with dark bars. The ear-lobes should be white, fitting close to the head. The beak should be silvery-white and rather short.

They are a truly beautiful bird, and have improved much by careful breeding, in the uniformity of plumage and other respects, since the commencement of the poultry show era.

In all Penciled Hamburgs the value depends mainly upon the exact and well defined marking of the plumage, which should be a dense black, and the color between, a clear silvery white. In the hen, the feathers are often so distinctly and evenly marked as to form parallel lines of black across the body of the bird. This is a little larger than the Golden Penciled variety.

Golden Penciled Hamburgs.—The form of this variety is the same as the Silver Penciled previously described, and the black penciling similar, the only difference being in the ground color of the plumage, which in that variety is a silvery white, and this, a rich golden bay. In this variety the color of the cock is much darker than that of the hen, often approaching a rich chestnut.

The tail of the cock is a greenish black, lustrous, and the sickle feathers distinctly edged with bronze or a reddish bay; sometimes the tail feathers are bronzed all over, though the former is considered the most desirable marking.

Silver Spangled Hamburgs.—The difference between the penciled and spangled plumage is, that while the former consists of parallel bars across the feathers, the latter have only *one* black mark at the end of each feather, which forms the spangle.

This black marking on the feathers varies in shape and size; the most popular and common are those with the round or moon-shaped spangles, which in some parts of England formerly gave the fowls the name of "Mooneys."

In this class the head of both sexes is silvery white, the hackle having each feather ending with a small black moon or spangle. The plumage of the body has each feather terminating with a greenish black moon or spangle, the size of the marking increasing with the size of the feather, which gives it a rayed or starry appearance. The spangles on the wing-covert feathers in both the cock and hen, form two distinct black bars across the wings. The sickle feathers of the cock are pure white, with a lustrous greenish-black spangle at the end of each feather. The feathers of the tail and tail-coverts are marked in the same way, giving the fowl a beautiful appearance. The hen is similarly marked. This variety has also the

rose-comb, as has been described in the general characteristics of the Hamburg fowls. The beak is blue, or horn-colored; the legs blue or slaty blue, and rather short. They are very active, upright, and graceful in their carriage, and among the most beautiful of our domestic fowls. Like all the Hamburg varieties, they are good layers of large white eggs, and non-sitters. It should be remembered by those not familiar with this breed, that many spangled Hamburg chicks are at first *penciled* in plumage, the spangles not making their appearance until after the first moulting.

Golden Spangled Hamburgs.—The principal difference between this variety and that just previously descriebd is in the ground color of the plumage, which, in this variety is a rich, deep golden-bay, the markings being quite similar, viz., each feather terminating with a distinct greenish-black spangle, round or moon-shaped, which should be quite large and regular in form. The hackle and saddle are a deep reddish bay, approaching a golden bay in color, with each feather distinctively striped down the middle with greenish black. The tail-feathers are greenish-black, and quite lustrous in the cock. They are admirable egg-producers: in proof of this we give the following experience of a breeder of this variety, Mr. Thomas I. Weir, of Wilmington, Del.:

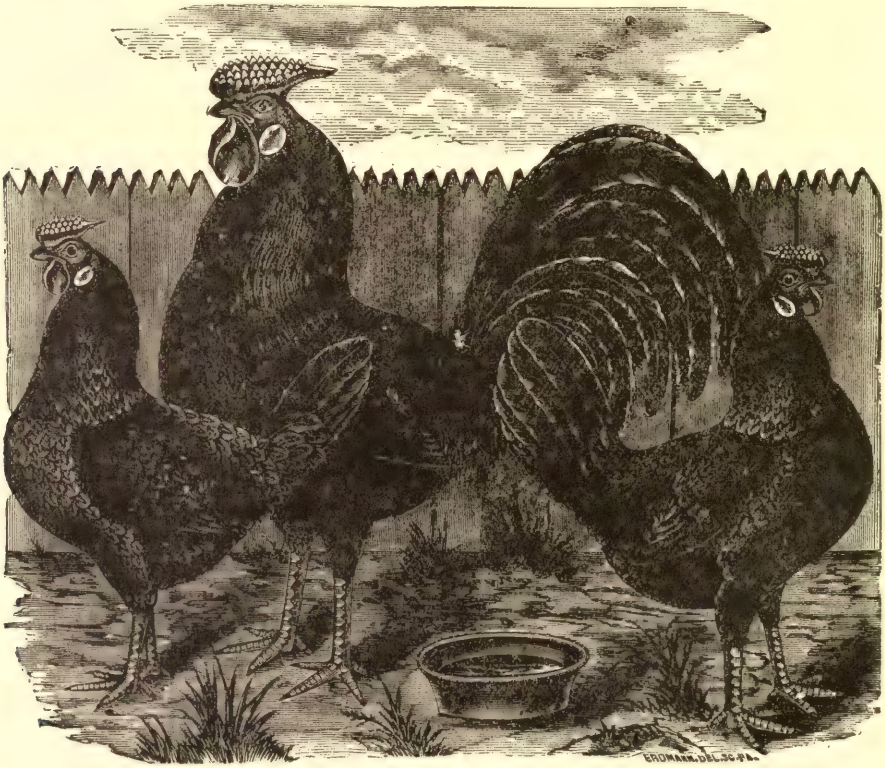
"I put together, March 1, 1876, two hens, three years old, and three pullets and a cock nine months old. All had been laying seven or eight weeks, but I only had a record of one of them to that date. I will here state that there was a difference in the shape of their eggs that enabled me to distinguish each hen's eggs from the others; I therefore gave each hen credit for what eggs she laid, and discovered that the young beat the old. All are now moulting except 'Little Nell.' She laid her first egg January 10, 1876, and fifteen during that month; in February, twenty-two, March, twenty-four; April, twenty-six; May, twenty-seven; June, twenty-six; July, twenty-seven; August, twenty; September, twenty-three; October, twenty, and to November 10th, six, making in all two hundred and thirty-six eggs in ten months for one hen.

The five, including 'Little Nell,' put together March 1st, laid, in six months, as follows: March, one hundred and eight; April, one hundred and twenty-one; May, one hundred and eighteen; August, one hundred and three; in six months, six hundred and seventy-four eggs for five hens. In May one pullet laid twenty-eight eggs. My Hamburgs were bred from imported stock." It will be seen by the above that hens of the Hamburg breed will lay well the second and even third winters, though of course not generally equal to the pullets. The cocks of this variety are slightly smaller in proportion to the hens than the other varieties of this breed.

Black Hamburgs.—It is supposed that this variety is produced by a cross with the black Spanish. They are slightly larger than other Hamburgs; cocks often weighing seven pounds, and the comb is also considerably larger. They, however, breed quite true to color, which is a rich lustrous black throughout. The beak is dark or nearly black, and the legs bluish-black. Their general form, symmetry, and points, are like the other Hamburg varieties, whose characteristics have been given under the heading of Hamburgs. This variety is said to produce larger eggs and more in number than the other Hamburgs, and are also more hardy.

White Hamburgs.—This is the least common of the Hamburg fowls, the penciled and spangled seeming to be the general favorites. They, however, possess the general traits of the breed, and of course come in for their share of merit among the Hamburg families. They are pure white throughout, and breed quite true to color. The beak and legs, as formerly bred, were a flesh color, but an effort is now being made, and quite successfully, to substitute the blue or leaden color for each, which has certainly resulted in a decided improvement to their general appearance. In economic value they are considered about equal in rank with other varieties of this breed.

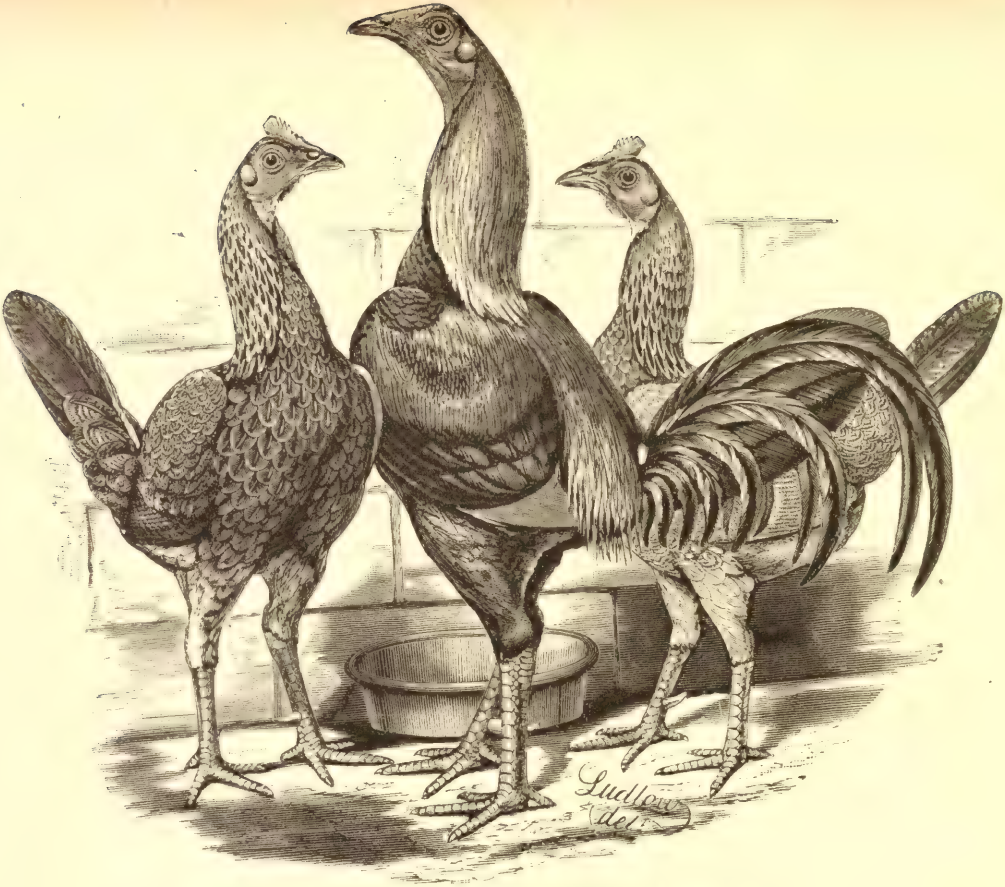
Merits and Defects of Hamburgs.—Since they are quite small, the consumption of food is proportionately small in quantity; hence the expense of keeping them is less than many of the larger breeds. They are noted for their egg-production, and are among the very best of winter layers; in fact, we doubt if any breed can excel them in this respect, though probably the Leghorns will equal them. They like best a wide range, and thrive most when allowed it, but can bear confinement very well if kept clean. They suffer from want of cleanliness more than almost any other breed; also from overcrowding, as we have previously stated. They are tolerably hardy, mature early, and will lay well through the second and even third winters. They are non-sitters, and give no trouble from broody inclinations, but when keeping them (as with all non-sitters), it will be necessary to keep a few others, such as the Brahmas or Cochins, to perform maternal duties to the young forthcoming Hamburgs.



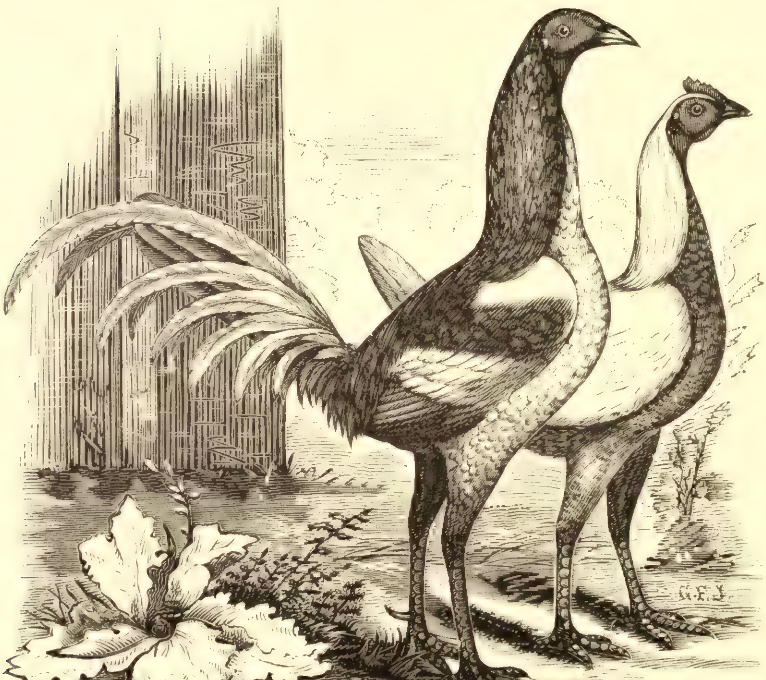
BLACK HAMBURGS.
Owned by W. Atlee Burpee, Philadelphia, Pa.

To the lover of the beautiful they are a source of pleasure, as the spangled and penciled varieties are perfect specimens of bird beauty, and cannot fail to excite the admiration of the beholder. They are also finely formed, and graceful in movements.

The greatest objection to them is their propensity to wander and fly; in the latter respect, they are perfect little "fly-aways," their small light bodies and strong ample wings making it perfectly easy for them to find the *other side* of a nine or ten-foot fence, when confined in a small enclosure. Mr. Wright says: "They may, it is true, be kept in a shed, but if so, the number must be very limited. Where six Brahmas would be kept, four Hamburgs are quite enough, and they must be kept dry and *scrupulously* clean." He also states that the penciled varieties are most delicate, being liable to roup if exposed to cold or wet, and for this reason it would be better not to have them hatched until May. The spangled are more hardy and



BLACK-BREASTED RED GAMES.
Owned by A. D. Warren, Worcester, Mass.



RED PILE GAMES.
Property of E. H. Blackett, Lawler, Iowa.

lay larger eggs than the penciled, but not quite as many during the year as the latter. The Black Hamburgs are considered to be the best for egg production, of this breed. Their chief merit in an economic point of view is this quality, since their small size does not make them very profitable as a table fowl. Their eggs are large for the size of the fowl, and white.

GAMES.

THE very close resemblance in form, color, voice, combativeness in disposition, and courage, between the *Gallus Bankiva,* or Wild Jungle fowl of India, and the domestic Game fowl, have led naturalists to conclude with confidence, that the former is the parent of the latter. Many naturalists of note in India, including Sir W. Elliott, Mr. S. W. Ward, Mr. Blyth, Mr. J. C. Jerdon, and Mr. Layard, who are familiar with the Wild Jungle species, are of the opinion that most, or all of our domestic breeds have descended from this wild species.

Perhaps no fowl has been bred so extensively and with so much of real interest and enthusiasm, in both this country and Europe, as the Game; and perhaps none with regard to which so many and varied opinions have been entertained, and so great a variety of breeds have been produced; in fact, their number is so large, that we shall attempt in our limited space, to give only the principal ones. They are considered by many bird fanciers to be the most beautiful of all the domestic breeds of fowls.

Their leading characteristics are a strong beak, long, sharp, and well curved; head long, thin, and tapering to the beak, and very strong at its junction with the neck. The comb, when natural, — that is, when it has not been dubbed, — is small, single, low in front, thin and evenly serrated, and of a brilliant red color, in most varieties, though in a few, like the Brown-Reds, Blue, and Gray, it is a very dark red, often approaching a purple. The eyes are large and fearless in expression, which are indicative of their character and disposition; for they are the most courageous and pugnacious of all domestic fowls; in fact, a true Game seems to know no fear. The neck is long, very strong, and well arched; the hackle short and close, each feather of it being more broad than in other breeds of this size. The breast is broad and well rounded, the back broad across the shoulders, rather short and flat, narrowing towards the tail, and the body full at the sides. The saddle feathers are short, corresponding to the hackle. The tail should be of medium length, and carried rather erect and spreading; the sickle feathers having a full curve and long. The wings are very strong and of medium length, well fitted to the body, slightly raised at the shoulders, the points coming under the saddle feathers when folded, giving the body there a narrow appearance. The legs are set rather wide apart, are rather long, bony, clean, and very strong; the spurs set low, are long and sharp, and slightly curved upwards. The feet are broad and spreading, the toes long and furnished with long, strong nails. The entire plumage is short, compact, and glossy. The carriage is proud, upright, bold, and fierce.

The hen corresponds in general form to the cock, and usually has spurs. It is said that such hens breed the best cocks, as far as the fighting propensity is concerned. Their flesh is noted for delicacy of flavor, and they are ranked among the first-class layers, when provided with a good range.

Trevor Dickens, Esq., of London, who is one of the most noted authorities in England on all points concerning the Game fowl, says of them: "The Game cock, as the undisputed king of all poultry, requires more careful judging in regard to shape than any other bird. The Brown-Reds have long been considered the most perfect in outline. With respect to the

varieties of Game, the kinds which take nearly all the prizes and cups are the Brown-Reds, Black-breasted Red, Silver Duckwing, Greys, and Piles, all of which are cup-birds.

The original wild varieties of Game fowl are three: the Black-breasted Red, with fawn-breasted partridge hens; the Brown-breasted Reds, with dark legs and dark-brown hens, and the Red-breasted Ginger Reds, with yellow legs, and the hens of a light partridge color. These three colors were probably reclaimed at a very early period, and are still found in India as wild birds. From them all the other colors were originally bred; the varieties hatching dark chickens from the Brown or dark Reds, and all others from the other two sorts.

The best criterion of blood in all Game fowls, is the *color of the eyes*, a point which has been, strange to say, totally overlooked in every work on poultry hitherto published. *Black* eyes show dark blood, and the hens of such strains lay white eggs. *Red* eyes denote red blood, and lay pinkish eggs. *Yellow* or *daw* eyes lay yellowish eggs. These last are inferior in spirit to the others. Brown and bay eyes result from crossing different breeds.

The only kinds much used for fighting, are those with black or red eyes, and the three varieties now usually employed are the Brown-breasted Reds, Dark Greys (which are strongest and hardiest of all), and Black-breasted Reds, with *white* legs and dark red eyes."

The principal varieties of Games are Black, Black-breasted Red, Brown-red, Blue, Silver Duckwing, Yellow Duckwing, Ginger Red, Grey, Red Pile, White Pile, White, Spangled, White Henny Game, etc. Including sub-varieties, there are in all from forty-five to fifty varieties of this breed, which is the most diversified of all domestic fowls. Their name is truly "legion."

Black-breasted Red Games. — This variety of the Game breed is a great favorite, and considered by many as possessing qualities superior to the other recognized varieties. Be that as it may, they certainly possess great beauty of plumage, are very stylish, with a proud carriage, are very hardy, courageous, quick, and sprightly, and usually breed true to feather. It is the most nearly related in color and form to the original wild fowl of India, — the *Gallus Bankiva*, — of any of the Game varieties. As the general characteristics of the Game breed have been given at the beginning of this chapter, we will not repeat them here, but simply specify the points of difference in the varieties described, since the general description of the Game breed applies in a great measure to all the varieties and sub-varieties of that breed.

The color of the head of the cock is a very rich red, rather dark; the neck hackle of the same color, free from black stripes and very glossy. The ear lobes, wattles, and comb are bright red; the latter (if not dubbed) is small and thin, low in front, and serrated, standing straight and erect; the eyes are quick and courageous in expression, and quite large; in color, dark red or bay. The plumage of the body is usually a rich dark red, being rather darker than the neck hackle. The breast is black; any mixture of other colors there is considered a grave defect, indicative of the birds not being pure-bred. The under part of the body is also black. The wings are a rich dark red in the upper part, and a dark bay in the lower, with a metallic or greenish-black bar across them, formed by the wing coverts.

The thighs are also black, and the tail feathers greenish black; the sickle feathers and tail coverts being very lustrous. The saddle feathers, like the neck-hackle, are a rich red. The back is either willow or dark horn color. The legs vary in color. The American standard recognizes the willow, olive, yellow, white, and blue; but among the English fanciers the willow is the color preferred, where all other points of merit are equal, though all are recognized, if the plumage be unexceptionable and bright, and the eyes dark bay.

The general color of the hen is a rich, reddish brown; the hackle being of a brownish-golden color striped with black; the breast, a deep salmon color shading off to a brown; the plumage of the back and wings is a reddish brown penciled with black; the tail feathers

are very dark brown, almost black. Spurred hens are considered the best to breed from, but are not as commonly found in this variety as in the Brown-red. These (the Black-breasted Reds) are considered the best layers among the Game breed, though nearly all varieties have a fine reputation in this respect.

Brown-Red Games.—Of all the varieties of the Game fowl, this is the most esteemed by sportsmen in England, and is considered to be the most perfect in form of all; their symmetry and outline being as near perfection as is possible to attain in the poultry line. They have very dark red combs and wattles that incline in color to a dark purple; the beak also is nearly black, with all the fearless expression characteristic of the Game breed.

The color of the head is a rich dark red, changing to a shade lighter in the hackle, which is beautifully striped with black. The back is a dark crimson red; the saddle feathers striped with black similar to the hackle. The breast is a very dark reddish brown, deepening to nearly a black as it approaches the thighs. The wing-bows are a dark red; the coverts are a greenish black and very glossy; the tail a rich glossy black with greenish reflections. The thighs are nearly black, and the legs generally a dark willow, or bronzy black, with dark talons. The feathers are quite short on the body generally, giving it a close, compact appearance.

The general color of the hen is a dark brown. The back is nearly black, while the breast is quite black and glossy, forming a pleasing contrast with the hackle, which is a brilliant gold, striped with black. The feathers of the neck are so short that they give it a very slender and graceful appearance. The wings are very dark brown or black; the tail also is black. It is said by connoisseurs in poultry matters, that the best hens are generally spurred, and their tail feathers show a slight curve, but, like all dark-combed varieties, they are not as good layers as those with bright red combs.

Ginger-Red Games.—The general color of the plumage of this species is a rich red throughout; the breast, in color giving the name to the fowl, which is that of a ginger-red, which deepens in shade towards the thighs. The wings have a brownish-red tinge; the tail is black, and the head and legs are also dark. The hen's plumage is also a yellowish brown; the hackle being a golden yellow striped with black, while the tail is black. These are not as beautiful in color as many of the other varieties, and are not quite as largely cultivated as some of the more varied plumaged birds. They are, however, favorites with many poultry fanciers.

Red Pile Games.—Next to the Black-breasted Reds, the Red Pile Game fowl is counted by many as one of the most popular of the Game families. They have long been highly esteemed across the Atlantic, as one of their best varieties, and one rapidly gaining favor in our own country. They are quite hardy and breed true to color.

The head of the cock is a deep chestnut red; the hackle of a lighter shade, while the breast is white, penciled with red. The back is a rich red, also the wing bows; the saddle feathers match the hackle in color, and the wing coverts are white, edged with red. The tail is white; any black feathers in the tail being considered a great defect. The eyes are red, or brownish red. Mr. T. Dickens of London says: "The reddest Piles are the best birds; the prize pens should be selected with bright red eyes and white legs." The hackle of the hen is light chestnut with white in the centre of each feather; the breast is a chestnut red, slightly mottled and shaded to a white under the body. The remaining part of the body is white, slightly penciled with chestnut red; the tail white. As will be seen by the description, they are a very beautiful fowl, which, combined with other good qualities, has placed them first among the favorites with many bird fanciers. They are very superior egg-producers.

White Pile Games.—The hackle of the White Pile Games is white, with slight penciling of red; the breast white, also the tail and wings, except the wing coverts, which

are bright red; the thighs are white, like the main part of the body; the back light red, while the saddle feathers match the hackle. The legs are usually yellow, but sometimes white. The plumage of the hen is mainly white, except the breast, which is a reddish brown. Like all the Game breed, they are hardy, good layers, and make excellent mothers, protecting their chicks against every enemy that invades their realm. Though not as showy and beautiful in plumage as the Red Pile, previously described, still they are a very neat, attractive fowl, and need to be seen only to be admired.

Silver Duckwing Games.—The general color of the cock in this variety is silvery white, with a clear white hackle; any black stripes in the latter being considered by competent judges at the poultry shows, as decidedly objectionable. The breast, under part of the body, and tail are black, with a metallic or greenish tinge; the wings are crossed with a steel blue bar formed by the wing coverts. The ear lobes, comb, and wattles are bright red, and the legs willow or blue, sometimes nearly a bronze tint.

The hen is a silvery gray of a bluish tinge; the neck hackle a silvery white striped with black. The breast has a yellowish tinge, and the tail is very dark gray, sometimes nearly black. In a show pen for exhibition, the legs and beaks should of course match in the different birds; for instance, a willow-legged cock with a blue-legged hen, would not be considered in good taste. The blue-legged birds are considered by many to be most purely bred, and the eyes of such are usually dark-red or bay.

Silver Duckwings are purer in blood than the Yellow Duckwings, and can be successfully bred only by mating those of this variety without the introduction of any other blood, while the Yellow Duckwings originated by a cross between the Silver Duckwings and Black Reds, and are only kept up by occasionally introducing blood from the latter. They possess the fine qualities characteristic of the Game breed generally.

Golden Duckwing Games.—These are similar to the Silver Duckwings, previously described, except the straw-colored neck hackle, and saddle feathers, and the copper-colored feathers of the back. The plumage of the hen is considerably darker than the Silver, the back plumage being a slaty gray, and the breast a salmon-red shaded to a brownish gray towards the thighs. The plumage of both of the Duckwing varieties is very beautiful, and considered by some to be more so than any other of the Game species.

Black Games.—Other points of merit being equal, as a general thing, a black plumaged fowl does not attract as much attention as white or gayer colored ones, and are consequently not as popular, but a rich, lustrous black, with green or metallic reflections from which all the other colors seem to be half-hidden and half-disclosed as they gleam in the sun-light, is indeed rich and beautiful in the extreme; although the dead black or russet-black produces a very different impression. The red face and wattles also show a pleasing contrast with the glossy black plumage.

Blue Games.—Fowls of blue plumage are quite rare, and we are surprised that it should be so, since some of them are very beautiful, especially the Blue Games, the Blue Duns, and Cuckoo fowl; they are, however, more frequently seen in England than in this country.

The general color of this variety of game is dark-blue; the head and shoulders shaded slightly with black; the saddle feathers of the cock of a golden red or yellow; the wing coverts also have the same tinge. The tail is dark-blue, and the legs and beak of a bluish-black color. The general plumage of the hen throughout is a dark blue. The comb and wattles are a very dark red, approaching nearly to a purple. They are hardy and possess the merits characteristic of the Game breed in general, except, perhaps, are not quite as good layers as the bright red-combed varieties.

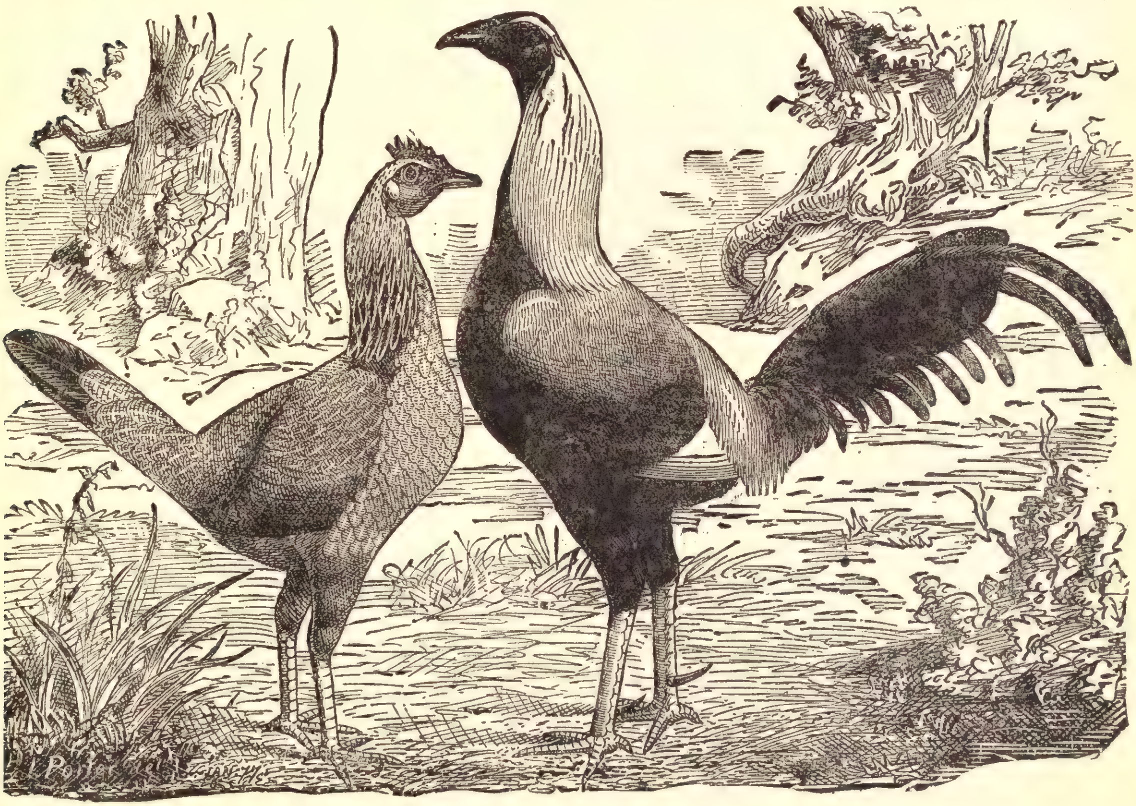
Gray Games.—As the name indicates, the general color of this variety is gray, or what might be more appropriately termed a silver gray, shading deeper into a black at the

WHITE GEORGIAN GAMES.
Owned by C. S. Lincoln, Warren, Mass.

breast; the wing bows are silver gray like the body; the wing coverts a glossy black, also the tail. The beak and legs are dark; comb, ear-lobes, and wattles of a reddish purple tinge.

The hen has a more dusky hue than the cock, though similar; her hackle is striped with black, which gives the general appearance of being considerably darker than the cock. Like all the Game species, the plumage is quite glossy and attractive. They are not as good egg-producers as most of the other Game varieties.

Spangled Games.—There seems to be no specific or well-defined standard as applied to this species, since we find them of all colors combined with white. The two varieties most attractive in plumage are the black and white, and red and white, though blue and white, buff and white, and brown and white are often seen. Though not as popular as most of the



GOLDEN DUCKWING GAMES.

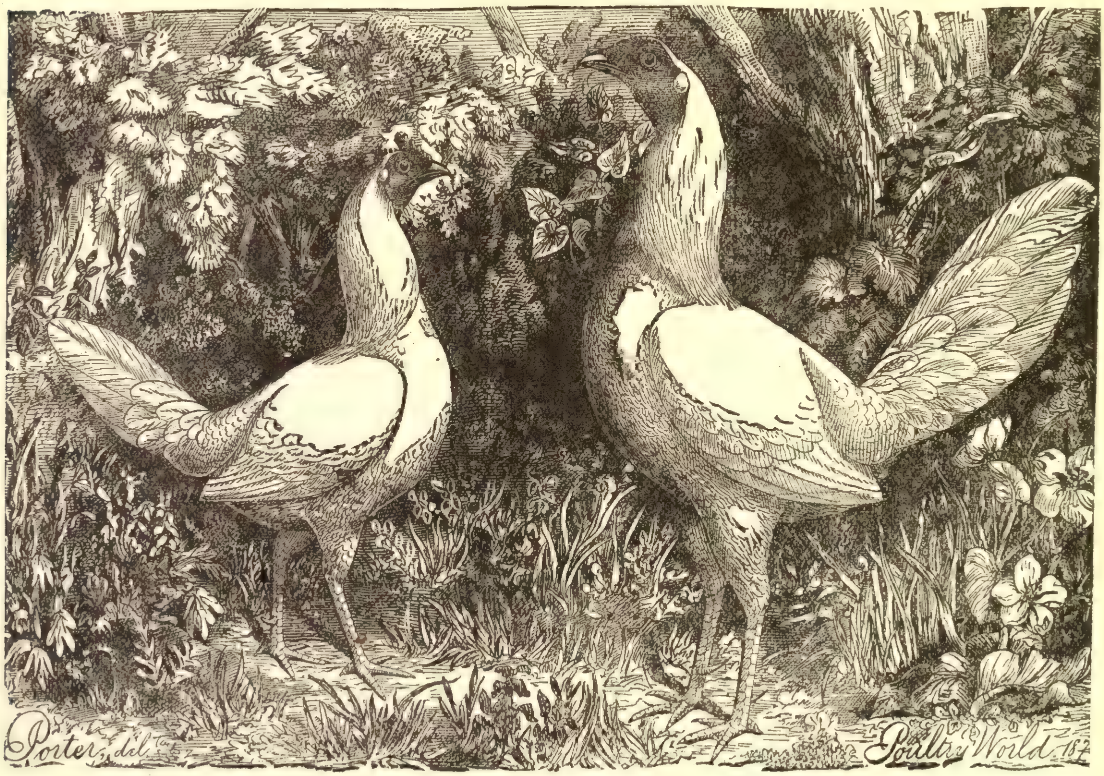
other varieties of Games, still, like all spangled fowls, they are attractive and pleasing in appearance, some of them being very beautifully marked. The comb and wattles are bright red. As layers, they equal any of the Game varieties, and deserve to be more generally known, since by that means they would be more fully appreciated.

White Games.—These fowls are in plumage a pure white throughout in both sexes, and their appearance, like all pure white-plumaged birds, is very neat and attractive. The eyes are red, and the legs are usually yellow, though sometimes white, either variety being considered pure bred. Any yellow or colored feathers are considered an indication of impure blood, and a great defect. They are quite vigorous and hardy.

Henny Games.—This is a peculiar species of Game in which the cock is feathered like the hen. These fowls are favorites in some parts of England, but are not as common in

either England or America as most of the other Game varieties. They are larger and heavier than the other Game species, and are of various colors,—red, white, black, gray, etc. Mr. Wright says of them:

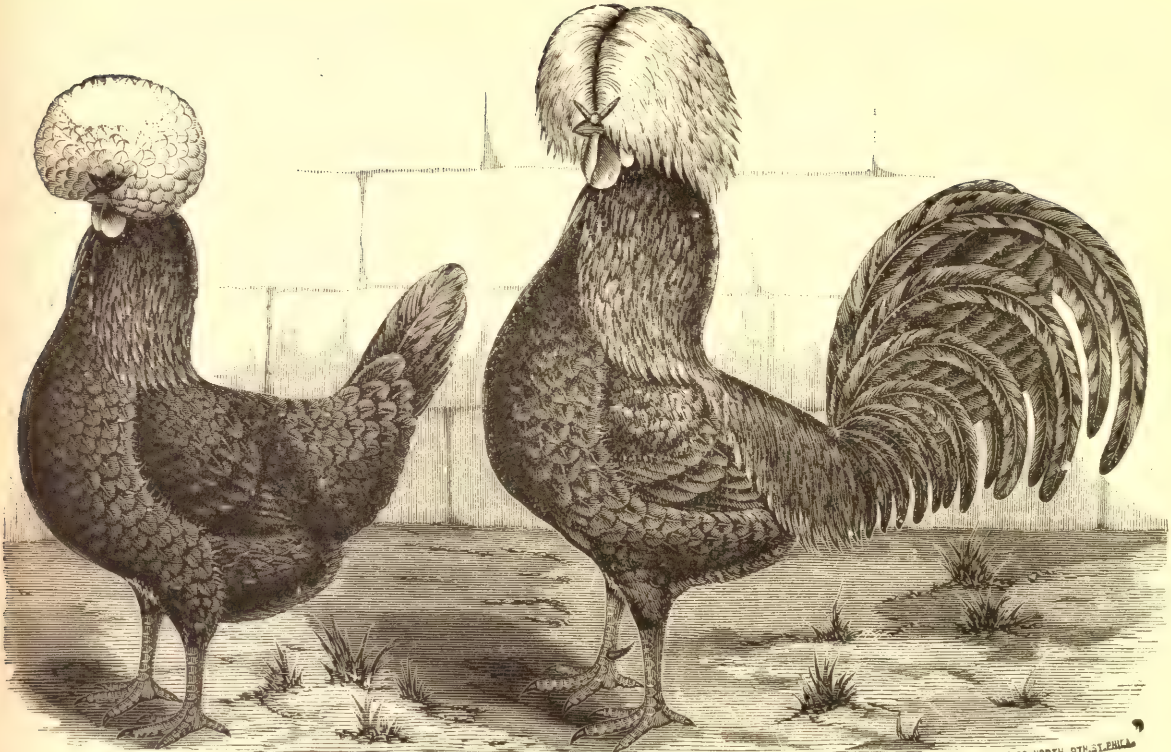
"On the whole, the probability is that the breed is descended from some very ancient progenitor, which accidentally exhibited the peculiar hen-plumage and struck the fancy of its progenitor. In Laced Bantams, which are known to have derived their hen-tailed character from a single cock which took Sir John Sebright's preference (and which was, very probably, itself descended from hen-tailed Game), we see how apt the feature is to transmit itself with a little care; and that our supposition is correct, and that the strain once formed was preserved sedulously apart from a period now impossible to determine, is rendered further probable by



WHITE HENNY GAMES.
Owned by Dr. C. S. Betts, Mt. Kisco, N. Y.

the different colors and style of birds, which are very different from the standard breed of Games."

Dr. Betts, an importer and breeder of Henny Games, says they are the most difficult to obtain pure of all the different Game varieties. The accompanying illustration represents birds of a pure white plumage with yellow legs. The true bred Henny cock lacks the very distinctive feature of sickle-feathers in the tail, and when an occasional bird, said to belong to this family, produces the sickle-feathers common to other breeds, there is reason for supposing that there may have been an antecedent cross, and such birds should be rejected from the stock-pens, since contamination would assuredly show itself in the progeny. This variety is said to be a fine table fowl, and very hardy.



WHITE-CRESTED BLACK POLISH.

BEARDED SILVER SPANGLED POLISH.

Fowls bred by Chas. Gammerdinger, Columbus, Ohio.

Merits and Defects of Games. — In beauty of plumage, hardiness, elegance of form, boldness, and courage, they are unrivaled, while as egg-producers, they are classed among the best, provided they have sufficient range. They are also next to the Dorkings (which are considered *best* of all) in delicacy of meat flavor, although their small size, as we have previously stated, would not render them a profitable fowl to keep for the market. Many consider them equal and even superior to the Dorking in this respect, yet we think the majority would decide in favor of the latter, though the difference would be slight. They are most admirable mothers, taking the best care of their chicks, and will defend them against any foe that may intrude, even at the sacrifice of life. They will also attack hawks with the utmost fearlessness, whenever the flock is assailed.

A recent incident of the kind came to our knowledge. A gentleman who was breeding pigeons and Game fowls, noticed one day a large hawk hovering over his premises, and shortly after saw it make a descent upon a flock of his pigeons. The pigeons seeing the danger, flew towards their house, all but one, that was not quick enough, for the hawk seized him and was spreading his wings for flight with his prey, when a young Game cock near by flew at him with such fury that the first blow of his sharp, long beak broke the hawk's wing, and he was easily made a captive. He proved to be an unusually large bird of his kind, and the wonder was that the little Game fellow could have accomplished his work so quickly.

Although we do not approve of pitting Game fowls, yet where there is a Game cock on the premises, there is no danger of intrusion from others. If they did attempt it, they would soon be reminded of "Home, sweet home," with the desire to be there as quickly as possible. Their pugnacity and fearlessness is truly remarkable, attacking any intruder, though he may be three or four times their own size, and what is more remarkable still, will be sure to be victorious.

The Game is too restless to bear confinement, and should never be fattened like other fowls. They eat but little, being of small size, and therefore are economical birds to keep; their eggs, however, are quite small. When confined they will not lay as many eggs as many of the other breeds of larger size, the Brahmas, Cochins, Hamburgs, or Spanish, and should have plenty of range if practicable; they are also less liable to fight among themselves, if allowed sufficient range.

POLISH FOWLS.

THE Polish fowls are distinguished by a crest or tuft of feathers on the top of the head, which adds much to their beauty; as an ornamental, and at the same time useful fowl, they are classed among the favorites of the bird fancier. They are non-sitters, and prolific layers of a moderate-sized egg, and with good care will lay well through the winter. Being a little sensitive to the wet and cold, they should always be provided with warm, dry quarters; though not as hardy as some breeds, yet with a little care they can be very successfully raised. They are plump-bodied, of rather small size, the weight of the cock being, on the average, from five to six pounds, the hens from four to five pounds. They are very stylish fowls, and of graceful contour. The feathers in the crest of the cock are pointed at the extremity like the neck hackle, while those of the hen are broader and round at the end. By this difference in crest, the difference in the sex of the partial grown chickens can be determined; while the size of the protuberance at the top of the head in chicks just out of the shell, it is said, will determine the comparative size of the crest in the full-grown fowls; that is, the largest protuberance will produce the largest crests, which are considered as pertaining to the best birds.

The comb of the Polish fowl is very peculiar, and resembles two little horns, something like the letter V in form; it is, however, quite small, and often entirely disappears in the bearded varieties. The principal varieties of this breed are the White-crested Black, Black-crested White, White, Golden, Silver, Bearded Golden, Bearded Silver, and Bearded White, though there are several others that are known, but are not common.

It is claimed by some that these fowls derive their name, not from Poland, but from the peculiar poll or crest of these birds; others, from the fact of their white crest resembling the tuft of white feathers worn by the Polish soldiers. However this may be, they are certainly a very stately and beautiful bird. The White-crested Black are the oldest and best known variety of the breed. They are docile in disposition, and fond of being petted. At poultry shows they always attract a great deal of attention.

White-Crested Black Polish. — This is the most common variety of the Polish breed, and also the most generally admired; the contrast between the glossy black plumage and the white crest of the bird, combined with their graceful form and docile disposition, rendering it quite attractive. The crest is not always a pure white throughout, however, for it frequently happens that the lower feathers at the base of the crest, sometimes called the beard, are black, especially in front; the fewer of these black feathers, however, the better, according to the opinion of poultry judges. The birds should always be provided with shelter from the rain and wet, as they have a tendency to roup; besides wetting gives the crest a soiled and bedraggled appearance, causing it to fall over the eyes, sometimes in such a manner as to nearly obscure the sight. The comb is bright red, small, horned in shape, as described in the general characteristics of the Polish fowl; the ear lobes white, and the beak dark, with large open nostrils.

The general plumage throughout is black, the irdescent character of which renders it very beautiful. When seen in the bright sunlight, all the mingled hues ever known seem to be half hidden and half revealed, and cannot fail to excite the admiration of those least interested in poultry matters. The body is full and plump, the tail large and carried quite erect. The legs are dark. The general carriage proud and erect, the neck being thrown back towards the tail. As we have previously stated, the crest of the cock is similar to the hackle feathers; that is, each feather being narrow and pointed at the extremity, while that of the hen is more compact, each feather being broader, and round at the end. They are very good layers, and considered among the best, though there is quite a difference in individuals in this respect, some hens being much more productive than others. The eggs are of medium size.

Mr. Edward Hewitt, the celebrated English connoisseur in poultry matters, says: "For the guidance of those who may adopt Black Polish fowls as their future favorites, it will not be out of place to throw out a few suggestions that may prevent annoyance and loss to the inexperienced. The chickens are apt to dwindle from perfectly robust health, drooping the wings and dropping off at from five to six weeks old. This is their trying time, and once safely got through it, they then become as hardy as most descriptions of fancy poultry. A little extra care as this time draws nigh, with the addition of chopped cheese, crushed hemp seed, and maggots from stale flesh, *well scoured* for a few days in bran to cleanse them from impurities, I always found would bring them safely out of their difficulties.

Another circumstance worth naming arises from the natural timid character of young Polands, when the crests are fully developed and they have not been accustomed to be handled. If taken up unexpectedly from behind, I have, to my chagrin, known several cases of them dying instantly, although most tenderly handled; the head suddenly dropped, a slight gurgling sound in the throat, and the most valued specimens were dead. This evidently arises from sudden alarm, as they cannot see coming danger from the rear when the crests are fully developed, and such accidents generally take place when the chickens have hitherto

been subjected to no restraint on a wild country walk. If spoken to soothingly *before* taking them in hand, this mishap is altogether obviated.

Among full-crested cocks annoyances frequently arise from the hens eating away the centre-feathers of the crest while yet immature. This evil practice, once acquired, is difficult to repress, the fact being, the cocks stand perfectly still and allow the young feathers to be eaten away piece-meal, as though not susceptible of pain even when the blood is flowing freely. The only course appears to be rather by prevention than remedy, viz.: to fasten the cock up separately for a few days during the time the crest-feathers are being reproduced, for when matured, even the same hens rarely continue this vexatious habit. Sometimes, when cocks have been thus repeatedly plucked by their companions, I have known the crest-feathers reproduced *beneath the scalp* (being unable to force a passage). This unnatural growth is frequently attended by severe local inflammation and even death. I had, some years back, two or three cocks, thus suffering, experimented upon by a medical acquaintance, the result being, that though he saved their lives, their crests were ruined."

The crests in perfect specimens of these birds are large and full, even in the centre, and in the hen nearly globular in form, being more compact than that of the cock, as the feathers are broader and round at the end. As a few black feathers will often make their appearance in the crest, it is frequently the case that birds are found at poultry shows having these feathers trimmed out or plucked, which, when detected (and with competent judges they usually are), disqualifies them at once from competing for prizes, as such deception and trickery ought to be discountenanced.

Black-Crested White Polish.—This beautiful variety of Polish fowls is at present almost unknown,—a fact greatly to be regretted, both on account of their rare beauty and economic value, as English writers on poultry mention them as being the largest and most hardy of the Polish family. They were formerly very common. It is hoped that more successful efforts will be made to revive this species among poultry breeders, for, from descriptions, it must have been the most valuable variety of this breed. They possessed the general characteristics of the other varieties, except they were much larger, the plumage of the body being pure white, and the head surmounted by a large black crest. They were extremely valuable as egg-producers, also as a table fowl, while their extreme hardiness obviated the now common objection to the present varieties of this breed.

Golden Polish.—There are two varieties of both the Golden and Silver Polish, viz., the bearded and unbearded; the former being more attractive, perhaps, the beard being a very unique marking in fowls, and a fitting counterpart to the beautiful crest of the head. The color of the crest of the Golden Polish is similar to the hackle, being a golden-bay with black lacing; the larger the crest the better, but it should not fall over the eyes so as to obstruct the sight. It should rise well in front, falling over at the sides and back with no division in the middle. The ear-lobes to all the Polish varieties are almost without exception white; the beak and legs dark, the latter being a kind of slaty blue, which are quite apt to grow lighter in color as the bird gets older. The general color of the plumage is a rich golden-bay, each feather marked with black, in the form of a spangle or lacing, the marking increasing in size with the size of the feather.

The ends of the wing-coverts have a large black spangle, which forms across the wings two distinct black bars when folded; these features also have a narrow lacing of black on the edge. The sickle-feathers and tail-coverts are also a golden-bay, each feather ending with a large black spangle. Like all spangled and penciled fowls, the marking of this variety is very beautiful. Their characteristics are similar to those described as applying to the Polish breed generally, though they are somewhat larger than the White-Crested Black variety, and are considered by most breeders of experience to be also more hardy. As the crests of all the Polish family are their main characteristics, those having the largest and most

perfectly formed, as well as desirable colored crests, should always be selected for the show-pen, or breeding purposes. A cock with an inferior crest is more apt to stamp this defect upon his progeny than a hen with a similar defect, but it is always safest and best to select those of both sexes having a large, perfectly-formed crest, since the result will be more satisfactory.

There is always a tendency to breed a little lighter; therefore for breeding purposes the darkest-colored birds should be selected, and the marking should be very distinct. They should be kept in dry soil, and always give more satisfactory results with plenty of range, though they bear restriction in this respect tolerably well. They never sit, consequently some other small fowl, like the Game, should be kept for incubating purposes. The young chicks should not make their appearance before the early part or middle of April, as they are rather delicate.

Bearded Golden Polish.—These are similar to those previously described, with the exception of the beard, which is a golden-bay, laced with black, making a black border around each feather; the feathers being small, give the beard of the cock a darker appearance than the rest of the plumage. It is full and heavy, and extends in a curve back of the eyes. This variety is said to be more difficult to breed true to all the points than the non-bearded. They are very docile and fond of being petted, like all the Polish varieties. The weight of the cock is from five to six and a half pounds; that of the hen from four to five and a half pounds. The best bearded strains of these fowls have neither comb nor wattles. The crest of the bearded Polish is generally larger than the non-bearded.

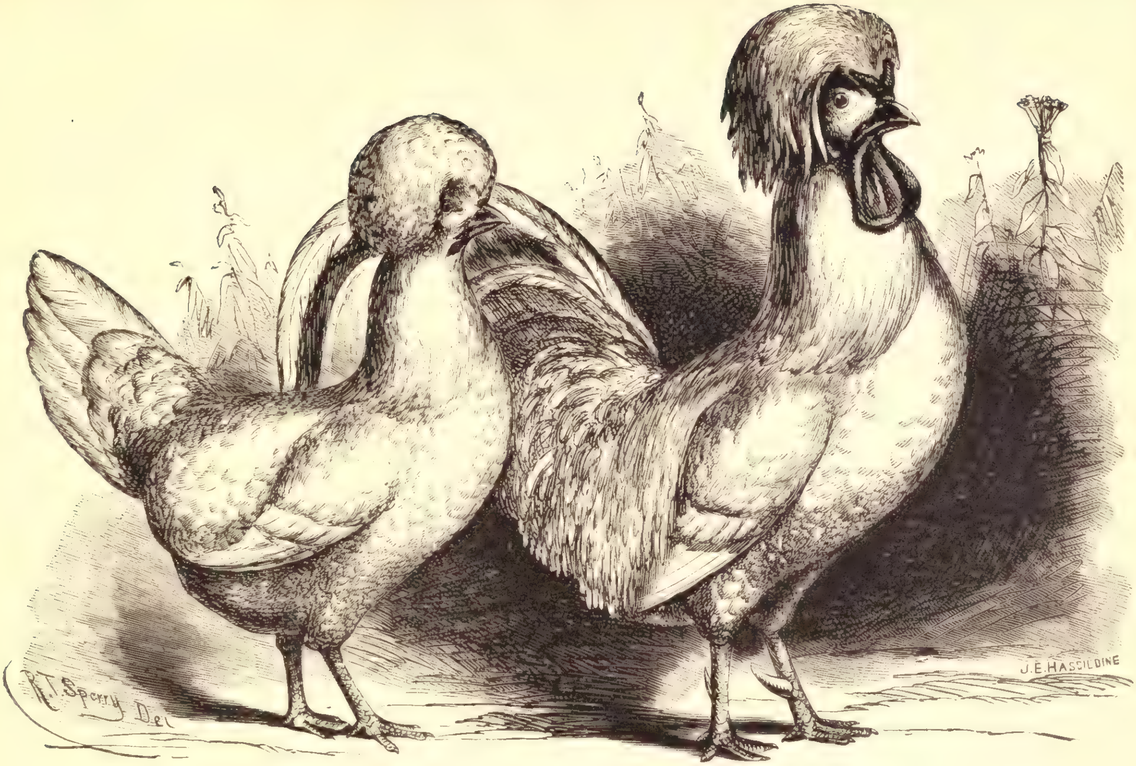
Within the last five or six years the bearded varieties have grown in popularity in this country, and will in time, we think, entirely supplant the non-bearded. In England they are altogether more popular than the latter (which are now seldom seen), from whence importations are frequently being made by our poultry fanciers, and there is little doubt that this beautiful variety will soon become equally common in our own country.

Silver Polish.—In this variety the marking is the same in every respect as the Golden Polish, previously described, except that the ground color in this variety is silvery white, instead of golden-bay. The general form, size, etc., are also similar to that variety. The crest is a silvery white, tipped or laced with black, but as the birds grow older the crest-feathers grow lighter, and in very old birds sometimes appear nearly white. The hackle is also a silvery white, laced with black, which is the uniform marking of the plumage of the body. The marking of the wings in two distinct black bars is also the same as previously described in the Golden Polish.

The tail is silvery white, with a black spot at the end of each feather. In many birds the feathers of the tail have a lacing or border of black around the edge, aside from the spot at the end, similar to the wing-coverts, and we think this marking adds much to their beauty. As in the Golden variety, the more distinct the marking, and dark the plumage, the better for breeding purposes, since the lighter marked birds produce chickens marked too light for beauty or desirability for the show pen. The beak is horn-colored; the legs, like all the other members of the Polish family, are a slaty blue.

The crest should be large and globular; that of the hen should be round as a ball, with no parting whatever in the middle. As the crest-feathers of the cock are longer and narrower than those of the hen, they will not be quite as compact, but should be globular in general outline.

Bearded Silver Polish.—This variety is precisely like the Bearded Golden in marking and general characteristics, except in the ground color of the plumage, which is a silvery white, laced with black. The marking in all good birds is distinct and uniform. The beard should be full and dark, every feather of which should be tipped with black, like



WHITE CRESTED POLISH.
Owned by H. T. Sperry, Hartford, Conn.

BLACK SUMATRAS.
Property of J. G. Bicknell, Buffalo, N. Y.

the hackle. After the first moult the feathers are generally somewhat lighter. They have a beautiful plumage, and like all the Polish varieties are highly prized for their ornamental as well as useful qualities. We might add respecting the crest of this variety, that the first year the feathers are black, finely laced with white, after which the color is reversed and is white laced with black. The lacing is slightly heaviest at the tips of the feathers throughout the plumage.

White Crested White Polish.—These fowls possess the general contour and characteristics of the other Polish varieties described, but are somewhat larger in size than any other except the Black-Crested White, which is the largest of the Polish family. They are more hardy than the colored varieties, and breeders of experience consider them more prolific in egg-production. The plumage requires no description, being a pure white throughout. The ear lobes are white, comb and wattles bright red; the beak dark, with large nostrils, which are peculiar to the Polish breed; the legs a slaty or dingy blue. They are very erect and proud in carriage, docile in disposition, making the most gentle and affectionate of pets. They are hardy and healthy when pure bred, yet the quickest of all fowls to show the deteriorating influence of a cross.

Bearded White Polish.—This variety is similar in all respects to the White Polish previously described with the exception of the beard, which is quite full and abundant, and like the entire plumage, a pure white. The crest of this variety is the largest and most perfect in form of all the Polish family. They are comparatively hardy, and like the other White variety, among the best layers of the breed. As a table fowl, they are plump, fine-flavored and delicate, and are quite easily fattened. The wattles and comb are nearly concealed by the crest and beard. Like all pure white fowls, they are very neat and attractive in appearance. They breed true to color, but where black or yellow-tinted feathers make their appearance, they are considered a defect by judges at the poultry exhibitions, other things being equal, the pure white plumaged birds bringing the highest prizes.

Merits and Defects of Polish Fowls.—The merits of this breed have already been mentioned in the descriptions previously given. They are among the best layers; being non-sitters they lay almost constantly with good care, except when moulting. In fact, some cases occasionally occur among them where the hen from excessive laying becomes so weakened and reduced, that consumption results, becoming thus emaciated, she droops and finally dies. The flesh is very fine for table use, plump, tender, and juicy, and is easily fattened. They are gentle and docile, easily tamed and fond of being petted, and seem peculiarly susceptible of attachment to those having the care of them. For this reason they are especially adapted for ladies' fowls, which quality, combined with their beautiful form and plumage, make them generally the favorites with their owners.

Mr. Wright, in his "Illustrated Book of Poultry," says of this breed: "They are perhaps of all breeds the best adapted to thrive and be happy in *strict* confinement, that is, if the sole run be a wired in and covered shed. Provided such a shed be kept very dry in the floor, and very clean, Polish will thrive and look well in it; of course, supposing the necessities of diet be attended to. Lime rubbish mixed with sand or gravel makes an excellent bottom for them; and if kindly treated, they become almost immediately as tame as cats."

Special precaution is necessary in rearing Polish chickens, owing to the prominence of the skull which supports the crest, and which is peculiarly sensitive to injury, never being completely covered with bone. For this reason, heavy hens, like the Brahma or Cochins, should never be employed as mothers for this breed. The greatest objection to these birds is a tendency to roup; but where care is taken to provide dry, warm quarters for them, this difficulty can be entirely avoided. They should be provided with shelter, and be shut into an

enclosure during a shower, since wetting the crest greatly mars its beauty, besides causing it to fall over the eyes and thus obstruct the sight. The crest and beard serves as a protection against frost to the comb and wattles. They should always be gently handled, and never suddenly frightened, as they are often frightened to death by being suddenly seized without being aware of a person's approach. There are other varieties of this breed described by different writers, and sometimes seen, such as the Buff or Chamois Polish, Blue, Gray, Black, and Cuckoo, etc., but these are very rare.

SUMATRAS.

THIS breed, although introduced into this country about thirty years ago, has never been extensively bred here. They formerly varied much as to color of plumage, but are now mostly bred pure black. They were formerly known by the name of "Sumatra Games," "Sumatra Ebon Games," "Sumatra Pheasants," and "Sumatra Pheasant Games," to distinguish the different colors. As the name indicates, they are natives of the island of Sumatra, and are a small active bird, and in some respects slightly resemble the Game species, yet are materially different from them. They have been described as resembling in form the wild Pheasant, more than any other fowl, especially in the length of the tail. The head is broad with small comb and wattles, which are bright red.

The comb is what is called a "pea comb;" the beak strong and powerful, eyes lustrous, quick, and fiery; the birds generally indicate something of wildness in look and manner. The neck is long and gracefully curved, the breast broad and well rounded, the legs slender and symmetrical, with powerful thighs like the Game. The plumage is rather compact and black, with beautiful metallic reflections. The tail, which is the most noticeable feature of the bird, is, in the language of Dr. Bennett, who received the first importation of them into this country, "very long and flowing, with abundant plume and sickle feathers sweeping the ground, and in this respect, more closely resembling the bird of Paradise than any other of the gallinaceous race." The legs are unfeathered, and the cocks sometimes have even two or three spurs.

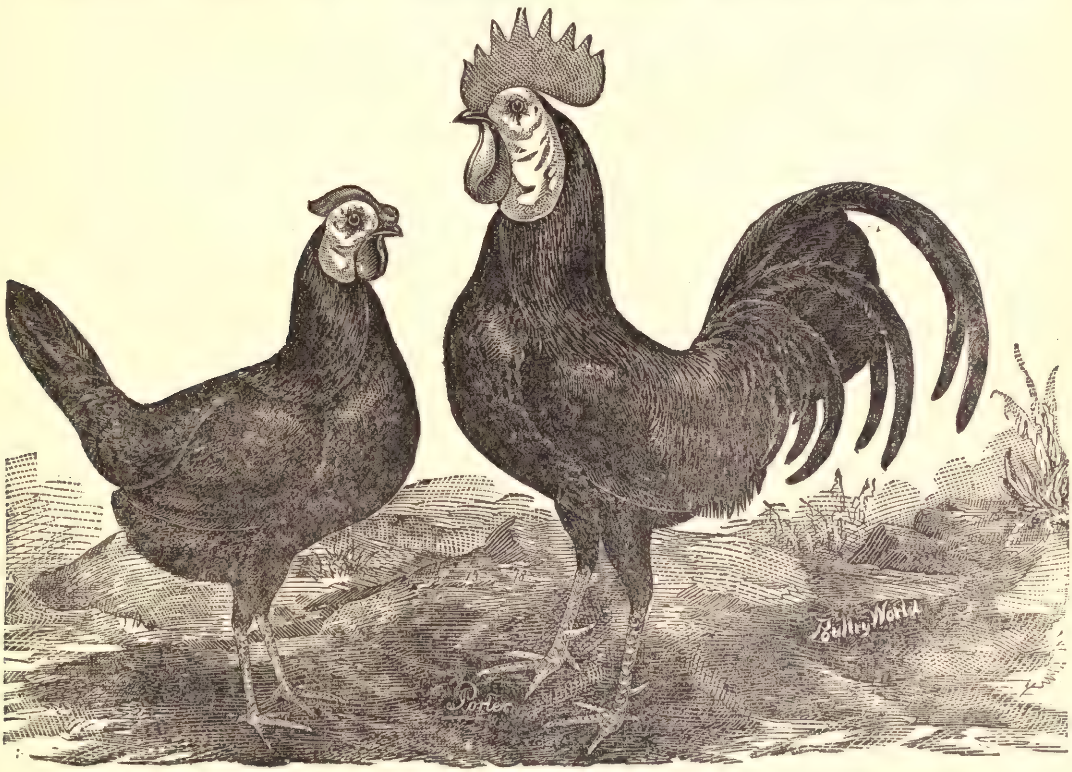
Merits and Defects of Sumatras.—These fowls possess the most lustrous and beautiful plumage of any black colored fowl we have ever seen; are good in egg-production, and are a good table fowl. They are, however, restless if confined, and will fly almost equal to a pigeon; consequently a very high fence is required to keep them within an enclosure. They breed quite true to feather, though an occasional white or red feather will sometimes appear, as in nearly all black plumaged birds.

SPANISH.

THE Spanish fowls have long been so popular in this country and Europe, and their merits so well known that a lengthy description here is unnecessary. Their symmetry of form, graceful and proud carriage, as well as beauty of plumage, have made them favorites with poultry fanciers, while their real value as egg-producers, combined with the former, have placed them among the most desirable breeds. Their flesh is of very good quality. Their eggs are large and white, and are said to exceed in weight those of any other breed, except the La Flèche. The Black Spanish is the most important variety of this breed,

and also the most common; the others are the Minorca or Red-faced Black, Ancona, and White. The average weight of the Spanish cock is about seven pounds, though sometimes they weigh eight. The average weight of the hen is about a pound less than that of the cock. They usually weigh more than they would seem, as they are full-breasted and plump-bodied, and have rather long legs. They rarely sit.

Black Spanish. — The most important feature of this variety of the Spanish breed is the white face, which gives the fowl a very unique and peculiar appearance. It should be an opaque white, smooth and free from wrinkles or any red spots. It extends over the entire surface from the base of the beak towards the back of the head; the wider and deeper, the more



BLACK SPANISH.

desirable. It is arched-shape above the eyes, reaching nearly to the comb, and extends below the depth of the wattles in length upon the neck, and joins the latter with the ear lobes, meeting under the throat. The comb is large, single, and deeply serrated, of a bright red, forming a striking contrast with the white face and glossy black plumage. The ear lobes are white and large; the wattles bright red like the comb, and very long and pendulous. The general color of the plumage is a rich, glossy black with lustrous reflections. The tail is carried rather upright, and the sickle feathers long and beautifully curved. The beak is a dark horn color; the legs a dark lead or blue in color.

Sometimes white feathers will now and then make their appearance, also red spots in the face. Such birds should be discarded from the breeding pen, as the common rule of Nature, that "like begets like," will make these birds, as propagators of their race, very unprofitable, where pure bred fowls are desired. The hen is in color and general marking similar to the cock, except that her plumage is not quite as glossy. This is the most popular and valued variety of the Spanish breed.

Minorca, or Red-faced Black Spanish.—This variety has long been a great favorite in some parts of England, but is quite rare in this country. With the exception of the color of the face, it much resembles the Black Spanish previously described, having the same plumage and otherwise general appearance. It is slightly larger, however, and more hardy than the Black. It is also considered the best layer of all the Spanish varieties.

Anconas. — This variety is mottled throughout in plumage, or is what is often called "cuckoo colored," and presents a very neat and attractive appearance. They resemble the Minorcas in other respects, but are somewhat less in size generally. They are seldom seen in this country, being better known in England.

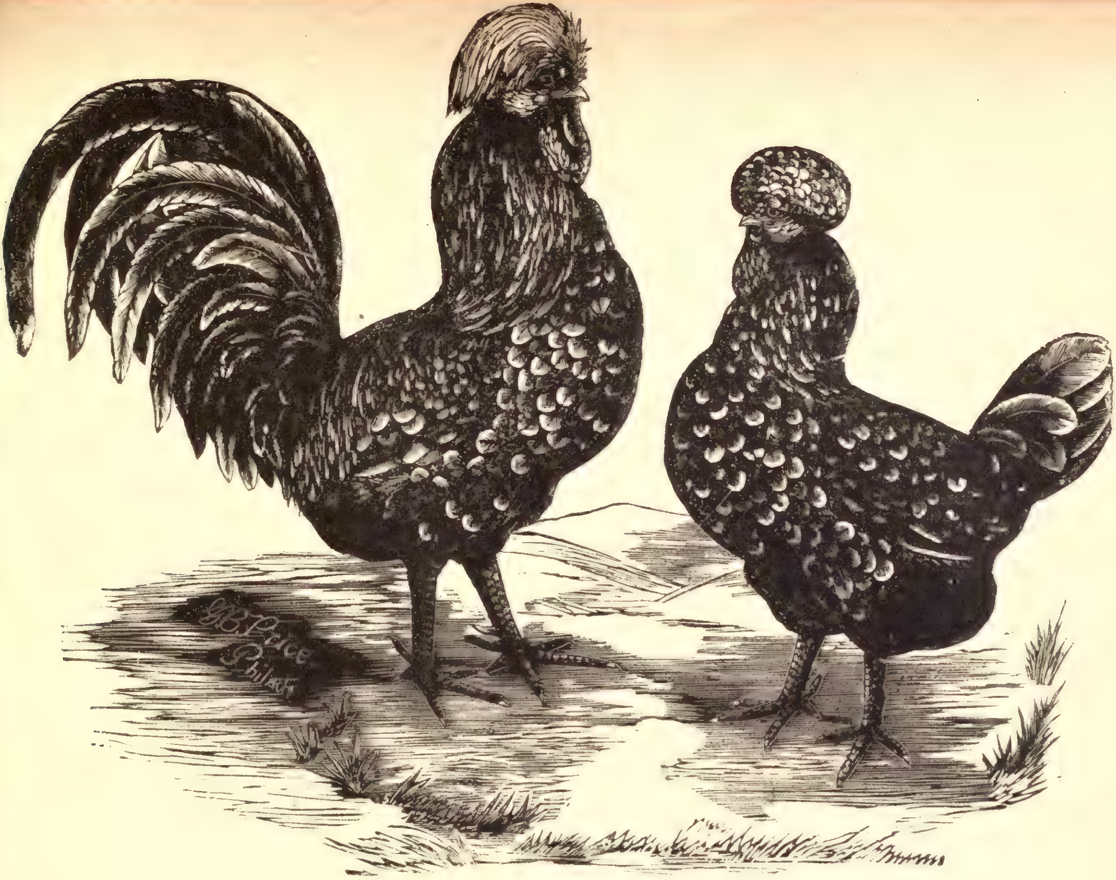
White Spanish. — This is similar to the Minorca variety, except in color of plumage, which is a pure white throughout. It is not considered quite as hardy as the Black, and is less common. It is, however, like all pure white plumaged fowls, — a very attractive bird, and quite conspicuous on a green lawn. Like all the Spanish varieties, it is quite proud and aristocratic in its bearing.

Merits and Defects of the Spanish Fowls. — The chief merit of this breed is in egg production, which is abundant, and the eggs of large size. As we have previously stated, the size of the eggs exceed those of any other breed, except the La Flèche, of the French breeds. They are, however, not good winter layers, unless provided with very warm quarters, such as produced by artificial heat. As a table fowl they possess considerable merit, but are not equal to the Game or Dorkings in this respect. As a "fancy" fowl, of course, the most popular will be the most profitable, since such are in greater demand, consequently the Black or White-faced variety will be the most profitable of the Spanish fowls. As a breed, they are rather delicate, compared with some others, and should always be provided with a warm house to protect them from inclemency at all seasons. Mr. Wright says of them, "to send fowls of this breed to winter shows in a basket not lined, in severe weather, is almost certain death." We should hope that any fancier who cared sufficiently for his fowls to send them to a poultry show, would also care enough for them to send them in a manner to be comfortably protected from the cold.

FRENCH BREEDS.

FRANCE has long been noted for its enormous production of eggs and poultry, to which its fine climate is especially adapted. Probably no country in the world is better suited to the raising of poultry, and no country where it is so extensively produced in proportion to its population. While many of the French breeds are somewhat delicate when exposed to our colder and more changeable climate, still in time they seem to adapt themselves to it in a great measure, and when better acclimated, become quite hardy, as the Houdans for instance, which is probably the most popular of the French breeds, although the Crève Coeurs and La Flèche are rapidly gaining in favor. The principal or most popular of the French breeds in this country are those already referred to, viz., the Houdans, Crève Coeurs, and La Flèche, although the Breda or Guelders and La Bresse are much prized in some parts of Europe, especially in England, and are well adapted to that climate.

Houdans. — This seems to be in our country the most popular and hardy of the French breeds, although the Crève Coeurs are mentioned by some writers as being the one most preferred in France for the quantity and quality of its flesh. They produce eggs in great abundance, which are of large size and white, while they are capital winter layers, with



HOUDANS.

CREVE CŒURS.

even ordinary care. Their flesh is also very fine, which has gained them the name in England of "The French Dorkings," the Dorkings being considered the *best* of all table fowls by the English. The cocks will weigh, on the average, from seven to nine pounds, and the hens from six to eight pounds. In size, form, and quality, this breed resembles the Dorking, the body being bulky and plump, with breast deep and full, and back broad.

The general plumage is black and white evenly intermixed, or as some have represented, "black and white spangled;" the crest, beard, and hackle being of the same color. The crest is not as large as the Polish fowls, and though full, falls backward, leaving the comb exposed, and not obstructing the sight. The comb is exceedingly peculiar, being bright red in color, quite prominent, and in general appearance reminds one of the antlers of a deer; it inclines backward towards the crest, is triple in form, the outsides opening like the leaves of a book, while the centre has the appearance of an "ill-shaped strawberry," as Mr. Geyelin, the English writer, has expressed it.

The comb of the hen is quite small, and looks like coral. Her crest is also quite round and compact. The beak is dark horn-color; the eyes are white or pinkish white, mottled with lead color or black. This breed has the peculiar mark of the Dorking, having a fifth toe detached from the others, and slightly curving upward. The general carriage is upright and lively. The cut of these fowls representing birds bred by Mr. Charles Gammerdinger, Columbus, Ohio, is a good illustration of the breed.

Houdans never sit, consequently a few Cochins or Brahmas should be kept for incubating purposes. The little chicks usually hatch better and earlier than other breeds, nearly every egg proving fertile; they also mature early. They bear confinement well, but should be kept clean and free from dampness.

Merits and Defects of Houdans.—With respect to this subject we subjoin the following, from the pen of the well-known and extensive breeder of various kinds of poultry, Mr. W. H. Todd, of Vermillion, Ohio: "Of all the French breeds we have tried, embracing Crêve Coeurs, La Flèche, and Houdans, we regard the latter as the hardiest and best, and, in real merit, they should rank high in comparison with any of the improved breeds, combining, as they do, very many excellent traits and advantages. Now thoroughly acclimated, Houdans are extremely hardy, early maturing, persistent layers, and one of the best table and market birds, the flesh being unusually white, juicy, and tender, with a large proportion of breast meat and less shrinkage in dressing than any other variety. Some claim that a Houdan will dress one-fifth more, ready for the kitchen, than any other fowl of the same live weight.

At maturity, cocks weigh seven to nine pounds, and hens six to seven, or more, when fattened. They are not termed 'high flyers,' and are contented almost anywhere, though in disposition lively and sprightly,—are not supposed to be very troublesome in gardens and orchards, and being good foragers, are well adapted to a free range, especially on the farm, where they are invariably well liked. They are virtually non-sitters, and, in order to breed them successfully, a few Brahma or Cochin hens should be kept to hatch and raise the chicks. Their eggs are generally fertile, and the chicks seldom die, except by accident. So rapid is their growth, that at two or three months old they rival the Brahmas, in weight, and are better developed for broilers and table use. Their thick crests and beards serve well as a protection from frost in winter. Admirers and breeders of Houdans are apt to take considerable pride and interest in them, which is not to be wondered at, as the beholder is always struck with their quaint, comical appearance."

The chickens mature early, feather rapidly, are also quite hardy compared with many of our choice breeds, and are, as previously stated, becoming more so, as they become adapted to our climate. We can recommend them to the farmer as a profitable fowl generally.

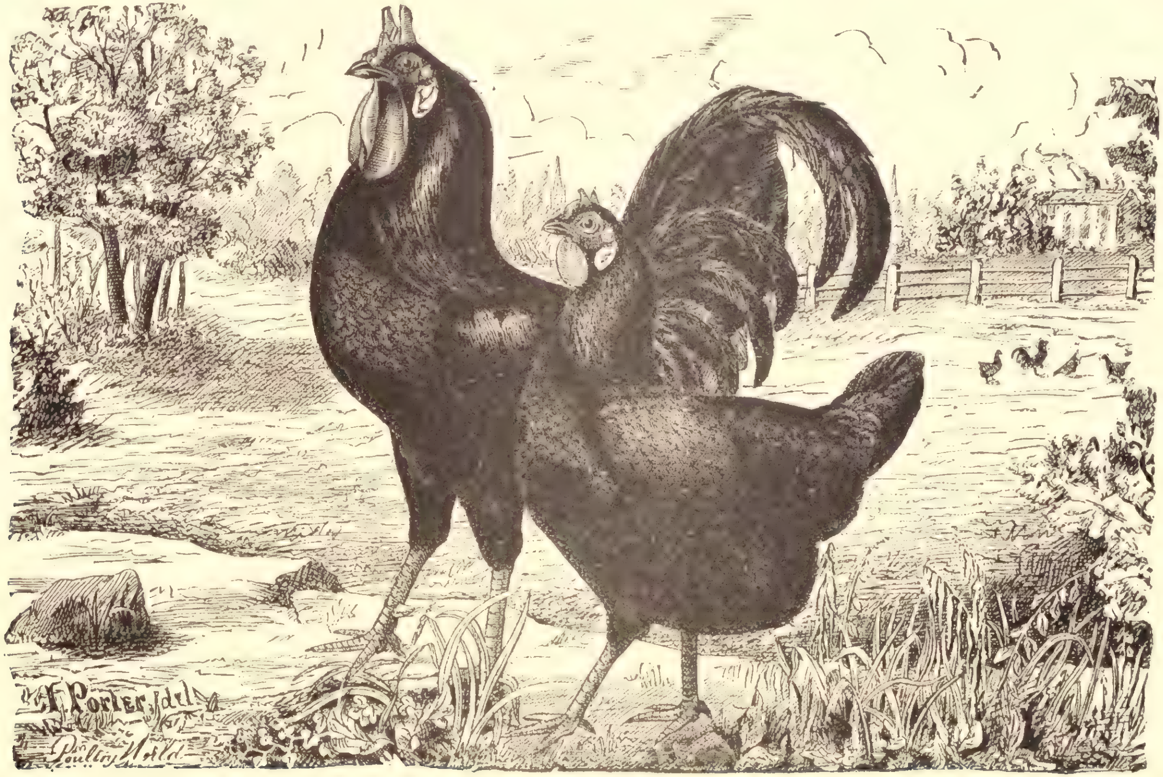
Creve Coeurs.—In conformation this breed resembles the Houdans, the principal difference being in the comb, which is a good size and consists of two horns in form, standing

nearly erect and brilliant red in color. The crest and beard are also heavier and fuller than those of the Houdan. The plumage is black with brilliant reflections, including the crest. The legs are a dark slate or black, and rather short. This breed is the oldest known in England of the French varieties, where it has been improved in general appearance, by breeders there, in producing a larger and fuller crest, than those of the imported fowls. They rarely sit, and are generally classed with the non-sitters. They are quiet and contented in disposition, and bear confinement well, and are tolerable good layers, though not equal to the Houdans. Their eggs are large and white. The chicks grow rapidly and mature early. Blue specimens of this breed are occasionally seen, also pure white, but the latter are very rare, and are probably mere "sports" from the Black, as all black fowls will occasionally produce white chickens, and the reverse, white fowls an occasional black chicken, which are freaks in which Dame Nature occasionally indulges.

Merits and Defects of Creve Coeurs.—Their principal merit is in their fine edible qualities, which, as we have previously stated, are considered by the French to be superior to their other breeds. The ease with which they are fattened, their early maturity, quiet disposition, and indifference with which they bear confinement, all tell in their favor, while the large size of their eggs is certainly an additional merit. They are not as abundant egg-producers as some fowls, though considered by many to be very good in this respect, and in our climate, are inclined to roup; but we believe it is the unanimous testimony of those having had experience in breeding them here, that they improve rapidly in these respects as they become acclimated, and we believe in a few years will be considered as hardy as any of our breeds of longer acquaintance. They are very valuable for crossing with other breeds, having a tendency to engraft their good qualities on inferior stock, the cross being almost without exception very hardy. However, as they are so large a fowl already, crossing with larger breeds would seem scarcely necessary for their improvement, yet where a farmer wishes to improve his stock that may be inferior to these, and does not object to a mixed breed, they are, as previously stated, very desirable.

La Fleche.—This breed resembles in general appearance the Spanish, having a red face, white ear lobes, and glossy black plumage. It is believed by many of our noted breeders and fanciers to have been derived in part from the Spanish breed. It is however much larger than that breed, the cocks often weighing nine and a half and ten pounds. It is long-bodied, long-legged, and rather gaunt-looking compared with the Houdans and Crève Coeurs, and has a very compact plumage. Its chief peculiarity in appearance is its comb, which is brilliant red and like two horns pointing upwards, giving the bird a very grotesque appearance. The wattles are also brilliant red, very pendulous and rounded; the ear lobes large and white. The beak is quite strong, and has in the cock a small knob of red flesh at its junction with the nostrils. It is dark in color, as also are the legs. This breed is being bred more extensively in this country at present than for a few years past, although it is still quite rare and the specimens seen at our exhibitions are few compared with some other breeds; in fact, we are surprised that the French birds are not disseminated more extensively in this country, since they possess so many excellent qualities.

Merits and Defects of the La Fleche.—The flesh of this fowl, like all the other French breeds, is of excellent quality, and in the opinion of Mr. Wright, to whom reference has frequently been made in this department of our work, is more delicate and juicy than that of any other breed of fowls, except the Game. It is highly valued in France, where it is very extensively produced, and always brings a high price in the market. The laying qualities of this breed are very good, the eggs being large and fine flavored. It does not however mature as early as the Houdans or Crève Coeurs, and is rather delicate in constitution, being exceedingly sensitive to cold or dampness, which inclines them, in our climate, to roup



LA FLÉCHE.

and rheumatic afflictions. But as this fowl becomes better acclimated, and special pains are taken by breeders to breed only from mature, and perfectly healthy and vigorous birds, we believe this breed will yet become as hardy in our climate as in its own. New blood should be introduced often; breeds that are most rare being liable to be most seriously affected by in-and-in-breeding, owing to the great difficulty of procuring stock for this purpose that is unrelated.

La Bresse.—This breed, though common in France, is rarely imported to this country, as it seems to possess no distinguishing characteristics to tempt the fancier. Mr. Wright speaks of the La Bresse as "simply a fine, large, and delicate-fleshed race of barn-door or mongrel fowl, formed by judicious breeding," and also being of various colored plumage, though generally resembling the Dorking, of which it is probably a descendant.

Merits and Defects of the La Bresse.—The chief merit of this fowl has already been alluded to in the previous description, viz., its delicacy of flesh, which so distinguish the French breeds. Its size is always in its favor, and it is also a very fair egg-producer; but as it seems to possess the characteristics of a *mongrel* fowl, there can be no standard of judging them specified; hence their fine points, as a bird, are lacking to the fancier. It is stated by our best writers on poultry that those varieties of the breed approaching nearest the Dorking are the most valuable.

BREDAS OR GUELDERS.

THIS breed is somewhat peculiar in the form of its comb, it being rather a depression than a projection, which, with the exceedingly small tuft of feathers at the top of the head, — which can scarcely be called a crest,— gives the fowl a very singular appearance. With regard to the description of this breed, we take the following from "The Illustrated Book of Poultry," which is the very best authority on poultry matters of which we have any knowledge: "This cannot be called a fancy breed in any sense of the word, but is a good useful fowl nevertheless; and the only reason it has not been popular in England is, probably, that it is inferior in size to the Houdan, which in general qualities it much resembles. It is a fairly good layer, though not quite as good as the Houdan perhaps, and very hardy; rarely sits; has a round prominent breast, and is consequently a good table fowl. As an exhibition variety it is inferior, and only occasionally takes prizes in the 'Any Variety' class. The breed is *really* one, but of various colors; the name Guelders being applied to that of a cuckoo or Dominique marking, while another variety, all black, is termed Breda. White fowls are also, but rarely, seen, which are probably sports from the black, and are also called Bredas.

The general shape is Polish, but the crest, though just perceptible, is only so, being nearly absent; what there is of it is the same color of the body-feathers. The greatest peculiarity is however in the comb, which is absent altogether, only a depression in the red skin being visible, just over the cavernous nostrils, which thus become peculiarly conspicuous, and show, in spite of the deficient crest, the close resemblance to the Polish family. The shanks are (rather scantily) feathered, the birds being, in addition, vulture-hocked. In America, this breed is more extensively kept and widely known than in England, and we have some reason to think may have entered into the composition of some of Brother Jonathan's new creations. We can thoroughly recommend it as a good and useful fowl, but have not seen a good specimen for some years; in fact not since the dissolution of the National Poultry Company, with whose last manager the Cuckoo or Guelders variety was rather a favorite.

We cannot in this case even attempt a Scale of Points, since there is not a sufficiently definite opinion as to the characteristics to which the fowl should be bred. The legs should be dark or slaty-blue."

Merits and Defects of the Bredas or Guelders.—It is almost needless to add anything under this heading, since the peculiar merits and defects of this breed have already been given or hinted. As a table fowl, its flesh is very fine, being tender, delicate, and juicy. It is also very hardy, like the Houdans, which seem to be the exceptions in hardiness among French fowls in this country and England, and rarely sits; thus possessing the good quality of egg-production usually characteristic of non-sitters, while their eggs are of good size and rich in flavor. They are, however, smaller than the Houdans, which gives the latter the preference, and do not possess sufficient beauty of form, and color of plumage to make them favorites in that respect with the poultry fancier. As a useful and hardy fowl for the general farmer, both for the table and egg-production, they possess much merit, but for our own part, we prefer those breeds where these chief merits, with the minor ones, are found combined with beauty of plumage and graceful contour.

DORKINGS.

THIS is not a new breed of fowls originated by some enterprising and enthusiastic fancier, but it is as old as the Roman Empire, its origin dating back through centuries, for we find them unmistakably described by Roman writers, in fact so definitely as to leave no doubt whatever that they were the one breed peculiarly and highly esteemed in that ancient Empire; and even to the present day they possess qualities and characteristics distinct from all others.

They are what would be termed at the present day preëminently an English breed of fowl, and are, as they always will be, a general favorite wherever known. The English regard them as superior to all other breeds as a table fowl, and it probably is unsurpassed by any and equaled by none, except, perhaps the Game; yet it has the advantage when compared with the latter, producing also a greater proportion of breast meat, being so very broad, deep, full-breasted, and plump in general contour. The average weight of the cock is from nine to ten pounds, though they occasionally turn the scales at eleven pounds and over; that of the hen from seven to eight pounds.

One peculiar mark of the Dorking is the fifth toe, which is placed above the fourth, distinct from the others, and curves slightly upward. The head is rather large, though not coarse,—beak stout and slightly curved; the comb of the colored varieties being either rose or single; the white variety always having the rose comb. The ear-lobes and wattles, like the comb, are bright red in color, the wattles being quite large and broad. The neck is large, of medium length, the back broad and long, the breast deep, broad, and full, the wings large, tail full, large, and well expanded, and legs of medium length, the whole appearance and general "make-up" of the fowl being compact and plump. The carriage is aristocratic and proud. They are quiet and docile in habits, and not extensive foragers, though they always thrive best with a good run, such as the liberty of a farm.

We are glad to know that this valuable breed of fowls is being more extensively bred in our country than formerly, and consequently its true merits, from experience and a thorough acquaintance, more fully understood and appreciated. The principal varieties of Dorkings are the Colored, Silver Grey, White, and Cuckoo, though the latter is less common with us than the English, being rarely seen in this country.

WHITE DORKINGS.

Silver-Gray Dorkings.—This variety of the Dorking family is a truly beautiful fowl, as will be seen from the following description by a noted English breeder, Mr. O. E. Cresswell, who has been very successful and has had extended experience in breeding them. "The chief distinctive exhibition points of Silver-Grays are as follows: The cock should have a pure silvery white neck-hackle, back, saddle-hackle, and upper wing-coverts; the black under-feathering of the back being entirely covered by the silvery white feathers of the neck, and the wing-coverts entirely free from chestnut patches. The tail, thighs, and breast, on the contrary, should be perfectly black. Perfection in the latter point is becoming very difficult of attainment, the extremely light shades now sought in the hen having, in my opinion, injuriously affected that great beauty in the cock,—a pure, glossy black breast.

After the second or third moult, the best cocks will show some grizzling on the thighs, but will not, on that account, breed any worse chickens. The hen should have body, back, and wings of a soft, silvery gray, perfectly free from red or reddish tinge; breast of a robin-red or salmon color; the neck-hackle as silvery as possible, with a fine distinct black stripe down the centre of the longer feathers. The most common faults in the hen are either distinctly reddish feathers in the wing or a slight brownish tinge all over the body. It may be observed that the latter of these faults seems to increase with age, while the former, on the contrary, decreases; and I have had birds very faulty in this respect as pullets, which, in the second moult, entirely lost the reddish feathers, and became perfectly silvery. The breast-color of the hen may vary from robin-red to pale salmon color; the latter is generally found with the most silvery general coloring; but I believe that the largest birds are almost always of the deeper color. The color of the Silver-gray Dorking hen, when anywhere near perfection, is of very great beauty. The light-gray ground is closely covered over by a minute penciling of darker gray, which gives that peculiar 'silvery' appearance so attractive, both in this case and that of the Duckwing Game hen."

The comb, ear-lobes, and wattles of this variety are bright red; the first may be either single or rose; when single it is large, upright, and evenly serrated. If it be a rose comb, it should be rather broad at the base, square in front, flat at the top, and covered with small projections or points, and terminate in a spike behind that is rather long and pointing slightly upward. The wing-coverts of the cock are a greenish-black, forming a wide bar across the wings; all the black feathers of the plumage having a beautiful gloss, with metallic or green reflections.

The tail is full, and in color a rich, greenish black, while the lesser tail-coverts have usually a narrow edging of white, giving a beautiful contrast with the black. The legs, with the highly-prized "fifth toe," that breeders are so careful to perpetuate, are flesh-color or white. The beak is also of the same color. The appearance of the hen is quite matronly, and they do, in fact, make the best of mothers when inclined to sit.

Colored Dorkings.—With regard to this variety we will say that in general characteristics, and all points except color of plumage, our previous description of Silver Gray Dorkings applies to this. We take the following with regard to them from the Standard of Excellence, which is what the judges at poultry shows abide by:

"Inasmuch as Colored Dorkings are of diverse colors or shadings, any of which are recognized, no extended or critical description of the colors of these will be attempted. It will be sufficient to say that the general characteristics of Colored and Silver-gray Dorkings are the same; the chief, if not the only difference between them, being in the *color* of their plumage. The numerical value of the "points" of Colored and other Dorkings is the same: when, therefore, Colored birds are shown, the first pre-requisite will be that they *match* in the color of their plumage and other points."

We are unable to give a definite description, owing to the variety of colors and shades recognized. The darker plumaged birds are, however, considered the most beautiful and

desirable of the colored variety, notwithstanding the latitude given by the Standard in this respect. They probably have more admirers than any other of the Dorking family, though all varieties are very attractive in plumage and general appearance. Mr. V. A. Blakeslee, of Winsted, Conn., who has for several years been a well known and successful breeder of this variety, says of them: "The average weight of the Colored Dorkings, as I find them, is cocks, 9 to 10 lbs.; hens, 6½ to 8 lbs.; although I have seen pullets from stock that is now in my yard weigh 8 lbs. at Christmas. I do not find them inclined to sit early enough to raise early chickens, and I have always purchased common hens to do my sitting; and in fact they are not to be classed as bad sitters. They are the best of mothers, and I will here say I have a hen in my yards that is three years old and has never offered to sit. I also find that at the age of even six and seven years they lay nearly as well as when two years old. Many write me: 'Are they hardy?' I answer yes, if you have a run for them, or put them on a farm; and no fowl will do better. Many have an idea that they are subject to roup. So is any fowl that is not properly cared for. In nine years I have not lost five fowls with the roup.

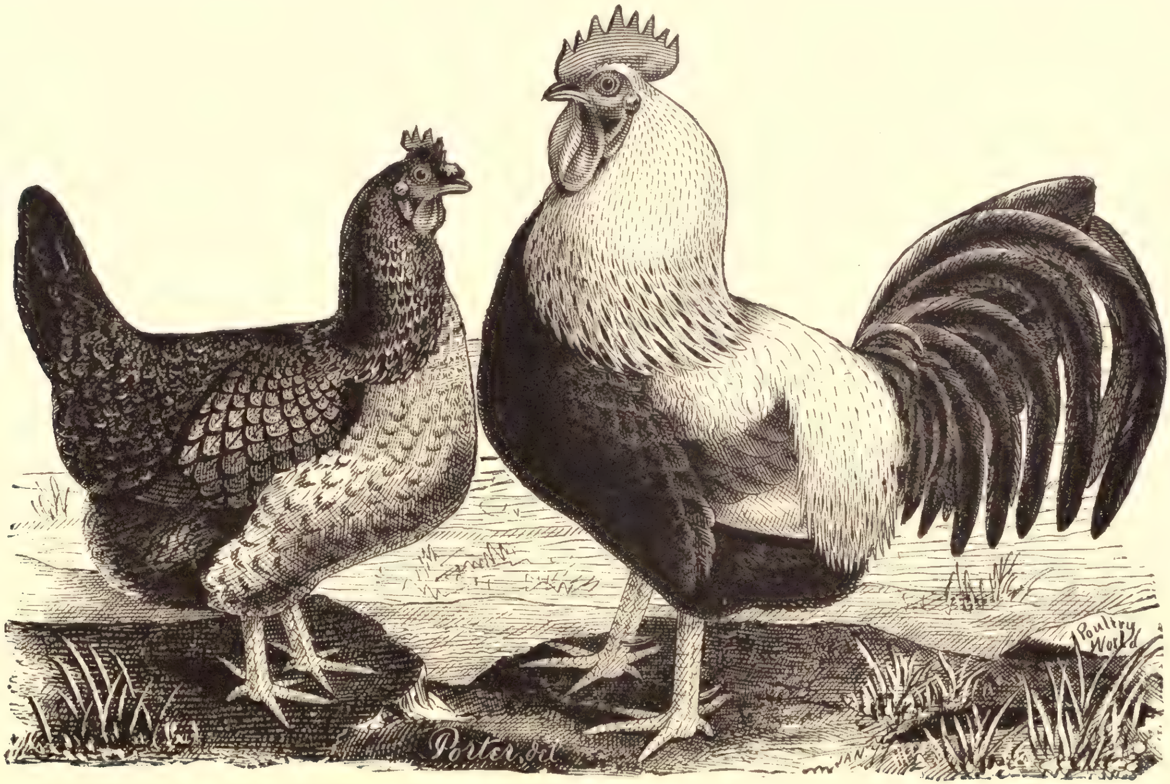
They will not do well in low, damp, confined quarters. Give them a run and high ground, and they will mature quickly and have more flesh with finer bone than any other known variety in the same time. In breeding early market poultry, a cross of the Dorking and Buff Cochin makes one of the best layers in winter that can be had. I find Dorkings good layers, though not as prolific in winter months as the Asiatics, but in the spring, from February to the next September, I will not except even the Leghorns; for I believe they will lay more eggs than any other variety of poultry, and, understand me, they will *lay well in winter*, if well kept. Pullets, with me, commence laying at about seven months old."

It is generally conceded by most poultry breeders that while the Dorkings may be called fair layers, with good care, yet they are inferior in the egg-producing quality to most of our standard breeds, taking the year through, though of course the *care* they receive makes a great difference in this respect, the same as with any breed of fowls. For a hen to be a *perpetual egg manufacturer*, she must be supplied with food material, and conditions suited to the article to be manufactured.

White Dorkings.—In symmetry this variety is said to surpass all others of the Dorking breed; its outlines and general contour being very graceful, while its beautiful pure white plumage, set off by the brilliant coral red of the comb and wattles, presents a scene that cannot fail to command admiration, even from the most practical and prosaic, who never see in a fowl anything but a manufactory of meat and eggs. This variety has doubtless more pure Dorking blood in it than any of the others, since for years it was the only variety that produced invariably the fifth toe, although now the others have been improved to the extent that they seldom fail to breed that peculiarity, so dear to the heart of the bird fancier. Pure white plumaged fowls are always attractive on a green lawn, and when given a large run, they are kept clean and healthy.

The White Dorkings are not quite as large as the colored varieties, but we see no reason why, with a little judicious breeding,—taking care to select the *largest*, and *only mature* birds (perhaps two years of age) for breeding purposes, or by crossing with the larger varieties, these may not be bred as large or even larger than their, at present, larger relatives. They are very gentle, easily tamed, and will feed from the hand with the utmost confidence, where gently treated. They are said to be better layers than the Colored Dorkings, their eggs peculiarly delicate, the shell being of a pinky or French white shade; they are also of large size. They, like all the Dorking varieties, require a dry soil and large range. If confined, their plumage becomes soiled and dingy, and the birds never seem in such cases to be healthy.

The great difficulty of breeding this variety—a difficulty with all pure white-plumaged



COLORED DORKINGS.
Bred by Mr. John K. Camp, Winsted, Conn.

fowls—is the tendency of yellow tinge to the plumage, especially in the cock; therefore it is desirable to breed always from those birds having the richest and clearest white plumage, and provide them with shade during the summer, to which they can have access. In general characteristics the description already given of the Dorking breed applies to the White variety. The plumage throughout should be a clear pure white; the comb should be rose, and set firmly on the head, standing erect, square in front, the top flat and evenly covered with small points or projections, and terminating in a spike behind that should be long and nearly straight, pointing slightly upward. The legs should be white or pinkish white, and the fifth toe well defined, separate from the others, and slightly curving upward. The eyes are full and bright, and the carriage quite stately and aristocratic. Mr. J. Y. Bicknell, of Buffalo, N. Y., a cut of whose fowls illustrates this breed, says of them:

"As a matter of taste, and as a characteristic of the Dorking family, I regard the fifth toe as very important. The cut does not represent it to my liking. It should not only be distinct from the others, but should curve regularly upwards. The Standard requires rose combs for White Dorkings and single combs for others. Single combs should be even, straight, of medium size, and free from side sprigs. Standard rose combs are square in front, tapering back, even on top, free from hollows, with a true, *single* spike behind. In selecting breeding stock be careful about good combs and toes, for they are quite apt to be faulty. Never breed from a bird with short, straight, fifth toe, having the appearance of being glued to the fourth. The popular idea that five-toed fowls are more subject to bumble-foot than others is all nonsense. The fifth toe is entirely out of the way of corns, bunions, or the tumors that characterize bumble-foot. Such tumors are always on the bottom of the feet, and are as common to Spanish, Games, Hamburgs, and other four-toed birds as to Dorkings. As to hardiness, they may be classed with Hamburgs and most of the smaller varieties, yet they are not so hardy as Javas, Asiatics, or Plymouth Rocks. They will not bear too much crowding, and when roup gets among them it proves very fatal."

Cuckoo Dorkings.—This branch of the Dorking family has the peculiar plumage called in England "Cuckoo color," but in America "Dominique." It consists of a marking of bars or pencilings of dark blue-gray on a ground of lighter gray, similar to the breast of the cuckoo, though the color and shades may vary considerably, the ground-color sometimes varying from nearly white to a bluish-gray, and the pencilings from a bluish-gray to nearly black. They are larger than the white variety, and slightly smaller than the colored; but are fair layers and the most hardy of the Dorking breed, which latter quality renders it best adapted of all this breed for general farm use. The marking of plumage, as above described, should be uniform throughout the body; the comb may be either single or rose, and, like all the other varieties, a bright coral red. The chief obstacles in breeding these fowls for show is the occurrence of an occasional reddish yellow, or black feather in the plumage, while, to be a perfect specimen, the cuckoo color should be uniform throughout. Although comparatively but little is known, this variety possesses merits that would make it a valuable fowl.

Merits and Defects of the Dorkings.—As a table fowl, the Dorking stands unsurpassed, being peculiarly delicate in flavor, tender, and juicy, with an abundance of breast meat. Their large size, early maturity, and rapid growth, also tell much in their favor, while their beauty of form and plumage are not the least of their merits. Gentle in disposition, they make the best of pets, and seem to enjoy being petted, almost as much as a cat does, being fully equal to the Brahma in this respect. For this reason alone, we could commend them to ladies as being suited especially to their care. They make the best of mothers also, never leaving their chickens until they are old enough to take care of themselves in a measure, and are in this respect better than even the Cochins and Brahmas, as they remain longer with their broods than most other breeds. They are however only fair in egg-

production, though with good care, suitable food, plenty of pure water, and sufficient warmth, they improve greatly in this respect. The eggs are large and round, and nearly equal in size at both ends. They will also improve in general hardiness, by long continued and judicious training for this purpose. Much can be accomplished in this respect, by not hatching the chicks too early, as they are peculiarly sensitive to the wet and cold. For our changeable climate, the middle of April or first of May is sufficiently early, and we have always noticed that the late chicks of this breed with this arrangement and favorable temperature, fully equal in size, at the age of three or four months, those earlier hatched.

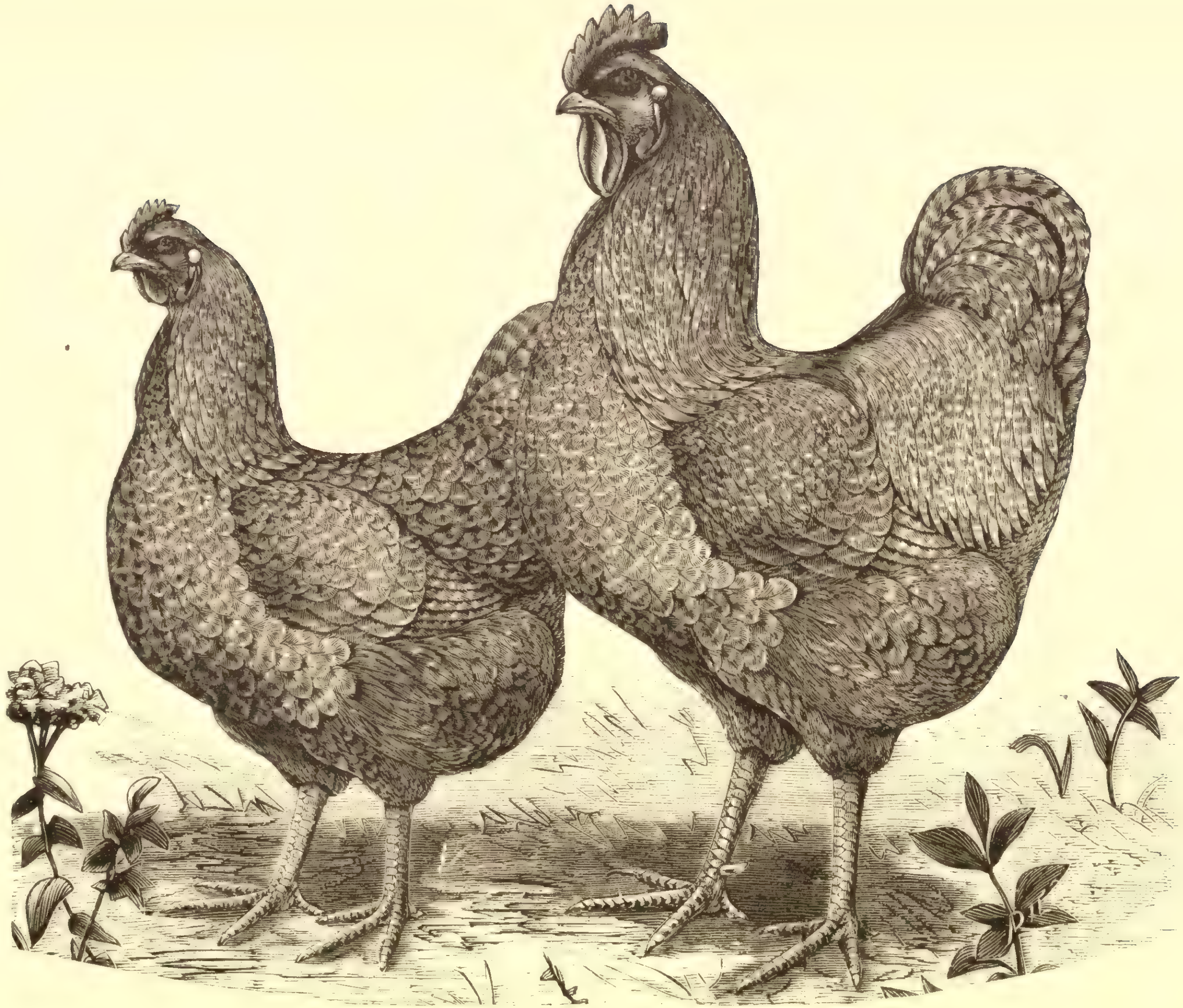
The Dorking breed, of whatever variety, should always have a dry soil, otherwise they will not thrive well. Many breeders put iron or other simple tonic in the water to ward off the gapes and roup, as in this case, as all others, the old adage proves true that "an ounce of of prevention is worth a pound of cure," for when these diseases once make their appearance among a Dorking flock they are very difficult to turn out again. All fowls in the least affected by either should be at once separated from the others until entirely cured. This breed is also subject to a disease called the "bumble foot," in fact, more liable to it than any other breed of which we are familiar. It does not bear confinement well, and when chickens are thus hatched, they are very apt to be delicate for the first two or three weeks, though fairly hardy afterwards. Confinement and wet soil are their bane, and the only successful means of keeping them under such circumstances, is to pay strict attention to cleanliness and drainage, and to give them fresh turf every day with vegetable food. Prize Dorkings have thus often been reared in graveled yards not exceeding three hundred square feet.

We would not, however, recommend it as a profitable fowl to keep, except with an extensive range. This breed, as we have previously stated, is very valuable to cross with others, the most successful and common being a cross with the Brahmas and Cochins; the Game is also used for this purpose, but not, however, with very great advantage, since it diminishes both the size and squareness of form without gaining very perceptibly in hardiness. A cross is sometimes made with the Houdan cock, but the plumage varies greatly, though the chickens are very hardy, and when matured lay very well, and the flesh is excellent. In laying qualities, the cross thus produced excel the Dorkings.

DOMINIQUES.

THE Dominique is one of the oldest of the American breeds, and resembles much the Cuckoo Dorking, also the Scotch Grays, previously described. In form, it resembles the Dorking; is of medium size, cocks averaging between seven and eight pounds, and hens six pounds. The plumage of the body, and even the feathers of the tail are a light slaty-blue penciled across with bars of a darker blue; the shading, however, varies, the penciling in some cases being very dark, or nearly black; the medium color is preferred. Whether the color be light or dark, the hackle and saddle feathers of the cock should be of a corresponding shade, any white, reddish, or golden feathers being considered a great defect; this objection can be avoided by careful breeding, choosing only the most perfect specimens for this purpose.

This description of plumage, which resembles the breast of the Cuckoo, will apply to a large class of poultry, many of which have been previously described. The Cuckoo Dorkings, Cuckoo Cochins, Anconas or Cuckoo Spanish, Cuckoo Polish, Guelders or Cuckoo Bredas, and Scotch Grays, all have this peculiar plumage, which is distinguished from the Penciled Hamburgs, which it closely resembles in marking, in the fact of the bars or penciling being



PLYMOUTH ROCKS.
Owned and bred by C. A. Keefer, Sterling, Ill.

larger and coarser, and more particularly in the penciling being shaded gradually dark into light, instead of the distinct and sharp contrast between the penciling and ground color that characterizes the Penciled Hamburgs. The eyes are large and bright; wattles broad and full. and are bright red, as are also the ear lobes. The beak and legs are bright yellow. The hen is marked similarly to the cock in plumage, and together in their plain "homespun" looking suit, although not beautiful, they are very suitable for many localities where a more showy bird would look almost out of place.

They are also desirable in plumage, in localities where the soot or smoke would soil the feathers of a light or white plumaged bird. The carriage is upright and rather sprightly. In breeding this variety, it is well to select a medium shade, or such as would be desired in the chickens, in the plumage of the hen. The cock should be of a slightly darker shade (since they are apt to breed a little lighter), carefully selecting those in both sexes free from either red, black, or golden feathers in the hackle or elsewhere; by this means they may be bred true to color and of a desirable shade.

Merits and Defects of Dominiques.—Dominiques are hardy and consequently bred with comparative ease; they are also superior table fowls, though not, of course, equal to the Dorking in this respect, though they are superior to the Dorking in laying qualities, and also the Scotch Greys, which they closely resemble in plumage. They make excellent mothers, mature early, grow rapidly, and are a generally useful fowl. We can freely recommend them as such, though they will probably never be a very popular breed for showing, not being very attractive in general appearance. They are excellent foragers. The cocks average from seven to eight pounds, and the hens about six pounds.

PLYMOUTH ROCKS.

THE Plymouth Rock is preëminently an American fowl. It is of New England origin, and supposed to have been produced by a cross between the Black Java or Cochin, and the Dominique variety. It has now become a well established and popular breed, and proves a very desirable and valuable acquisition to our American-bred varieties. It is the general experience of those who breed Plymouth Rocks, that mating birds that have a dark plumage in both sexes, produces a progeny too dark, with an indistinct marking, and a tendency to dark colored legs and beak, instead of the bright yellow so much preferred by American fanciers. This is especially true of the pullets, and can only be remedied by selecting a light-colored cock with the dark-colored hens, or having both the cock and hens nearly matching in color, and of the shade desired in the chickens, though the former is considered by most breeders to be the most desirable method. The average weight of the cock is about ten pounds and that of the hen eight pounds.

The plumage is Dominique, that is, of a bluish gray, with each feather penciled across with dark blue bars, the darkest specimens having the bars nearly black, yet the marking in either dark or light shades, should be distinct and free from a clouded or blended appearance. The medium shade is considered the most desirable color. Any mixture of other colors, such as white, black, and red feathers (as is sometimes the case), is considered a great defect, and such birds should be excluded from the breeding pens. They are symmetrical in form, have a plump body with well rounded breast and broad back, having in all the appearance of compactness and solidity. The head is of medium size, and somewhat resembles the Cochin. The beak is yellow in color, short, stout at the base, and well curved at the end. The comb is of medium size, single, upright, and evenly serrated; ear lobes and wattles bright red, and

of medium size, and fine texture. The neck is rather short, or perhaps we should say, medium, and well arched, with a very full hackle, giving great width at the shoulders.

The wings are of medium size; the tail rather small, but larger than that of the Cochin, and carried nearly upright. The legs are of medium length, and bright yellow, and the carriage of the cock upright and commanding. The hen is marked similarly to the cock, but seems, if anything, more compact and plump in body than the cock. Her manner is quite matronly. There was formerly considerable difficulty experienced in breeding the Plymouth Rock true to color, but time and patience, with judicious care in selection, have corrected this evil, and they now breed very true in this respect.

Merits and Defects of Plymouth Rocks.—They are superior table fowls, large bodied and plump; they also grow rapidly and mature early, making good broilers for the early spring market, while their superior laying qualities are too well known to necessitate comment in that respect. Their extreme hardiness is also a strong argument in their favor. We give the following respecting this breed, from the well known poultry breeder, W. H. Todd, of Vermillion, Ohio: "The longer we keep them, the better we like them, and, of all breeds, we think Plymouth Rocks *the fowl* for the farmer, and for general purposes. They combine more in themselves than any variety we know of. Are so hardy and healthy that they seem proof against the diseases that annually carry off so many fine birds. The chicks are lively and strong, and mature very rapidly, becoming large, and early fit for market. Their flesh, in quality, is fine grained, tender, and juicy, and, as dressed poultry, they are plump, full-breasted, and with fine, yellow skin and legs, look well and sell well in market. They can be depended on for eggs nearly *all the year round*, as well as for sitters and mothers, in season. Are not high flyers, and are excellent foragers, when given their liberty." The plumage of these birds is not as attractive as that of many breeds, it being really homely and grave in color, but their really economic and valuable qualities as egg-producers, and as a table fowl, place them in the front rank as a fowl for general purposes on the farm.

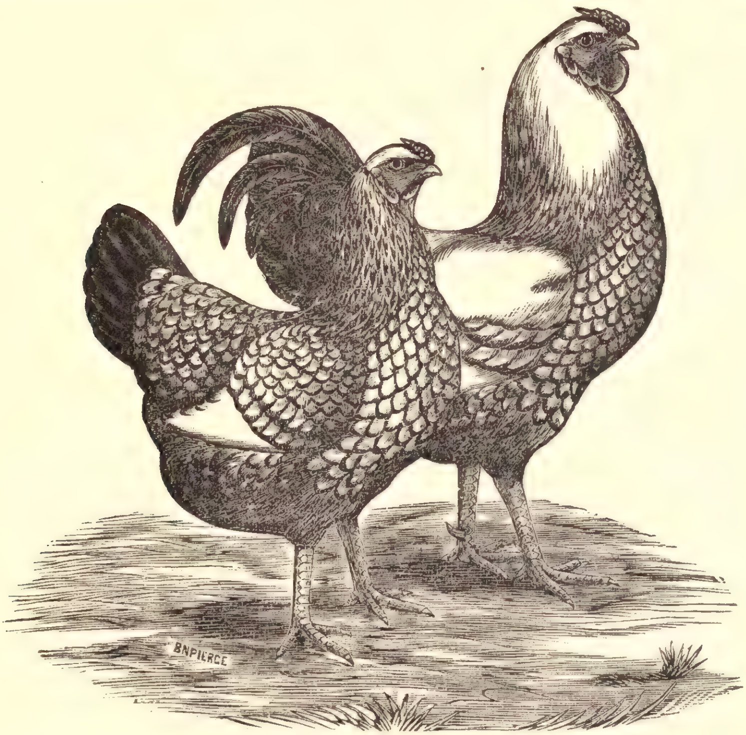
ANDALUSIANS.

THIS breed is a native of the province of Andalusia in Spain, and was formerly classed with the Spanish varieties, but is now considered to be a distinct breed. It is larger and more hardy than the other Spanish varieties, and unlike them also, the young chickens feather rapidly and easily, which adds much to their chances of life against storms and cold, and gives them the advantage in this respect. They are a very useful fowl, producing eggs abundantly, and are very desirable as a table fowl also. The comb is similar to the other Spanish varieties; also general contour of body. The plumage is quite attractive, being a kind of dove color or bluish gray, approaching a black on the back, and quite glossy. The neck-hackle is dark slate, and sometimes nearly black in color; the tail bluish gray; the beak and legs are also of a dark blue tinge, approaching a slate color. Sometimes the plumage is penciled slightly with a darker hue or black, which adds much to the beauty of the bird. They have become more generally known, within a few years past, and also more popular. The plumage of the hen is similar to that of the cock, except of a slightly lighter shade. The cock usually weighs about seven pounds, the hens from five to six pounds each. They are more precocious than the Spanish breeds, and also rather pugnacious, but not sufficiently gamey in disposition to be troublesome. The hens have been known to sit, but this is very rare among them. They are classed with the non-sitters.

Merits and Defects of Andalusians.—They are, as we have already stated, very prolific as egg-producers, having frequently been known to lay from 200 to 225 eggs in a year, which is certainly a *very good* egg record for any breed of hens. They are also very hardy, feather easily and rapidly, and mature early, young cocks often crowing at six or seven weeks of age, presenting a most ludicrous and amusing appearance. The flesh is of fine flavor, tender, and juicy; they are also plump-bodied and easily fattened, and do not consume as much food as some breeds of their size. They do not breed as true to color generally, however, as the Spanish breeds.

AMERICAN SEBRIGHTS.

THIS, as the name indicates, is an American breed of fowls, being one of the late breeds, and having been but little known until a comparatively recent date. They are at present, however, becoming quite common, and highly appreciated, combining as they do many excellent qualities, both as a table fowl and for egg production.



AMERICAN SEBRIGHTS.
Owned by B. D. Maycumber, Truxton, N. Y.

Both single and rose-comb fowls are to be found of this breed, also those with smooth and feathered legs; but those are generally preferred with a low rose comb, and unfeathered legs. The ear lobes are bright red. When matured the cocks will average nine pounds, and the hens about seven pounds. They are plump-bodied, with a prominent breast, the body being broad and deep, resembling in shape that of the Dorking; plumage black, even and heavily laced with white; tail solid black; the legs rather short, and bright yellow.

Merits and Defects of American Sebrights.—These fowls mature early, and the chicks are quite hardy. They also fatten readily, and the flesh is of very good quality. They are excellent layers when well cared for, but like many other breeds will thrive best when allowed considerable range, although they bear confinement well. They are contented in disposition, and will not attempt to fly over a fence four feet high. They make good mothers when allowed to sit. They do not, however, breed quite as true to feather as some of the older and long-established breeds, but are improving in this respect in the hands of intelligent breeders. As a fowl for the table and egg-production, they cannot fail of giving good satisfaction, when properly cared for.

BLACK JAVAS.

THE origin, description, etc., of the varieties of the Java breed represented in this country were prepared for this work by Mr. J. G. Bicknell, so well known as a poultry fancier, and an extensive poultry breeder. The origin of the Black Javas is as follows: "About thirty years since a family living in Missouri came in possession of three eggs, from the yard of a celebrated doctor who delighted in the ownership of a few fine fowls called Javas. The doctor would neither sell the progeny nor consent to having it grace the yards of his neighbors, but his coachman 'borrowed' the three eggs above named, and from them the American Javas have all descended. They were first brought into Dutchess County, N. Y., about twenty-five years ago, by a family removing thence from Missouri, and about fifteen years since by the same family into Orleans County, N. Y., where they have been bred in large numbers ever since. In all this time no fresh blood has been introduced, all crossings having been obtained by different matings of the same family.

Right here let us remember that most fowls are made of crosses, and when one type is decided upon, we must keep clear of foreign blood in order to retain that type, and all crossing, whether by one or more breeders, must be from the original stock. That is just what has been done with Black Javas, and their activity and manifest vitality strikes us forcibly at first sight. Until three or four years since they have been bred in comparative obscurity—yet in their immediate vicinity they have been noted for their large size, quick maturity, hardiness, and beauty. The color is a rich lustrous black, with that beautiful green shading so desirable; comb single; shanks black, approaching willow, free from feathers. The bottoms of the feet are always yellow, corresponding with the color of the skin. When served on the table the flesh does not present that objectionable dark color common to Spanish and some other breeds, but is equal to the Plymouth Rock in every particular.

At the outset let it be understood that Javas are not of foreign origin, but are an American fowl and deserve an American name, still the name has nothing to do with their merits or demerits. Modern Javas bear no relation to the Plymouth Rock. The Java side of the latter was in reality a Black Cochin, and merged into the Cochin class where it properly belongs. Among those who are acquainted with them, I find the most universal belief is that they are like the Javas of ten years ago—more Cochin than anything else. Let us not confound the so-called Javas of 'ye olden time' with those of the present day. They are entirely unlike Cochin in shape and style, and in almost every particular. Our American Javas have characteristics of their own, differing from any other known breed, clearly demonstrating the fact that they are indebted to no other recognized variety for their existence. They present large size, long bodies, and deep, full breast—just what is required for usefulness, hardiness, and superior table qualities.

In breeding them, care has been exercised in selecting birds of certain shape and a good degree of vigor, hence their vitality and activity are rarely equaled and never surpassed by fowls of equal size. Notwithstanding these facts no high fence is needed to keep Javas within bounds. In my long experience with nearly everything in the line of domestic fowls, I have never found a breed better adapted to close quarters, nor one that could resist the attacks of disease in every form with more fortitude. I have never lost one with any disease. Occasionally I have seen one attacked with roup, consequent upon exposure while attending shows, and in every case, some of which were severe, a few days time and simple remedies effected a permanent cure. When we consider this, and the fact that they have been bred in for twenty years, we cannot fail to credit them with sterling worth.

In selecting breeding stock, be sure to select birds with straight combs, brilliant black plumage, black shanks, and dark colored eyes. Willow shanks are tolerated, but are objectionable in young Javas. In old male birds, however, we can seldom avoid them. *Never breed from red feathers.* Better allow a little white than red. The standard calls for 'brilliant red' comb, which is correct for male birds, but some of the striking characteristics of the breed are *black* comb, face, and wattles among females. Pullets should *always* have them, and if retained at maturity so much the better. I now have a few hens two years old with comb, face, and wattles nearly black. Kill all birds that show striking defects, and retain only first-class ones for breeding purposes. When first hatched, and until they moult their first feathers, Javas will show very much white, but when matured every white feather should disappear.

Mottled Javas.—This valuable acquisition to our poultry department was originated ten years since by crossing a large white hen with a Black Java cock. The hen was selected from a flock of large white fowls highly prized for their superior laying and table qualities. They had been bred pure for many years, but were unlike anything described in the Standard. The first cross, although not intended for the purpose of forming a new breed, developed qualities worthy of cultivation. In crossing for new breeds it is highly important that both parents are from established strains; otherwise we have so many types to contend with that the results are entirely uncertain.

Although accidental, the cross that produced this new variety was in harmony with this principle, and now we find them breeding with as much uniformity as many of our old established breeds. In color they are black and white, closely resembling Houdans in this particular, but in no other. The color should be broken, black and white throughout, not a large patch of black followed by patches of white, but both evenly distributed. If either predominates it should be the former; yet we find, as with Houdans, some will be too light and some too dark in color. Although they are called 'mottled,' they are more properly *splashed*, but the term 'Splashed Java' would not sound quite as euphonious as the name chosen. Their history, after describing Black Javas, must necessarily be short, for the general characteristics of each are very nearly alike, yet I think the fresh blood introduced by the white hen has a tendency to give the mottles an advantage over the others in laying qualities; at least I have found it so with my stock. As they have descended from parents with yellow shanks on one side and black on the other, I find both colors are common, yet neither disqualifies. The shanks should be yellow, blotched with black; but even when black alone appears the bottoms of the feet are always yellow.

In selecting stock, utility first, and then beauty, should be the rule. The former in domestic fowls consists in hardiness, early maturity, and large size, with good laying and table qualities. Almost any variety possesses one or more of these qualities, but a combination of all, with beauty added, can hardly be expected. No domestic fowl, according to our opinion, approaches nearer to this high standard than a flock of *well-selected* mottled Javas. They are certainly attractive, and at first sight impress us with their proud and noble appear-

ance. Like a valuable animal of any kind, they denote a capacity for *business*, and that is just what they possess.

The breeding stock should be selected with a view to large size, uniformity in markings, small combs, and, if possible, with yellow shanks blotched with black. They, like the Black variety, were bred very carelessly regarding fine points by those who accidentally produced the original stock; but careful breeders are now improving them from year to year, and even now the uniformity of markings is equal to that of the Houdan, which has been bred so many years.

In order to breed any stock satisfactorily, certain rules must be understood and followed. Some may have raised superior specimens, regardless of all rules, by the force of qualities already inbred, but improvements cannot be expected unless great care is observed in crossing and mating. Fowls with superior qualities already inbred will continue to reproduce good specimens with far less trouble than was required to bring them to that desired point; still they will deteriorate rapidly unless great care is exercised in the selection for breeding purposes.

Merits and Defects of Javas.—In our opinion, no fowls are better calculated to adapt themselves to the wants of him who desires, in his poultry, an automatic machine that will manufacture eggs and chickens unaided and uncared for, yet I hope they may never fall into such unworthy hands. They are certainly adapted to the farmer who gives his fowls free range and good quarters, one who desires large profit in eggs and flesh. No better choice can be made by him who has only a small yard and likes a combination of beauty and utility, and who does not want a kind that is always in his neighbor's yard.

I have bred Plymouth Rocks for ten years, and in points of utility have considered them fully equal to any other recognized variety. I still value them, in this respect, as highly as ever, but the great trouble with them is that they breed too many imperfections. In order to get two or three pairs of exhibition birds we must breed a score or more chicks. Javas possess all the good qualities of Plymouth Rocks, without so many defects. From a flock of fifty or more, there will be only a small per cent. of culls, instead of a small per cent. of good birds. Java hens are good breeders and rear their chicks well, yet are far less persistent in sitting than Asiatics. They are good summer and winter layers, and the chicks are ready for broilers at an early age.

In all kinds of thoroughbred stock we have an acknowledged standard, a certain established type representing every point in perfection. Some of these points may be so thoroughly established that little or no care is required to retain them, while others are seldom reached. The type for Black Javas is,—body long and broad; breast deep and full; comb single, straight, and of medium size; eyes brown, the darker the better; shanks black, or black approaching willow; plumage rich, lustrous black throughout.

Every experienced breeder knows that all stock has what may be termed common defects, faults that often manifest themselves. It is with these that we have to contend in breeding for fine points, hence the necessity of thoroughly understanding them. Among the common faults of all black fowls, are occasional white or red feathers. Javas are not exempt from these faults, and, in addition, crooked combs and light colored eyes often annoy us."

MALAYS.

IN describing this breed, we give the following from Wright's Practical Poultry Keeper: "The Malay was the first introduced of the gigantic Asiatic breeds, and in stature exceeds that of any yet known. The cock weighs or should weigh from nine to eleven pounds, and when fully grown should stand *at least* two feet six inches high. But the general size of this breed has of late greatly deteriorated. In form and make, Malays are as different from Cochins as can well be. They are exceedingly long in the neck and legs, and the carriage is so upright that the back forms a steep incline. The wings are carried high, and project very much at the shoulders. Towards the tail, on the contrary, the body becomes narrow—the conformation being thus exactly opposite to that of the Shanghai. The tail is small, and that of the cock droops.

The plumage is very close, firm, and glossy, more so than that of any other breed, and giving to the bird a peculiar lustre when viewed in the light. The colors vary much. We consider pure white the most beautiful of all; but the most usual is that well known under the title of brown-breasted red game. The legs are yellow, but quite naked. The head and beak are long, the latter being rather hooked; comb low and flat, covered with small prominences like warts; wattles and deaf-ears very small; eyes usually yellow. The whole face and a great part of the throat are red and naked, and the whole expression 'snaky' and cruel. This is not belied by the real character of the breed, which is most ferocious, even more so than Game fowls, though inferior to the latter in real courage.

Malays are subject to an evil habit of eating each other's feathers, a propensity which often occurs in close confinement, and can only be cured by turning them on to a grass run of tolerable extent, and giving plenty of lettuce, with an occasional purgative. The chickens are delicate, but the adult birds are hardy enough. They appear especially adapted to courts and alleys, and may not unfrequently be seen in such localities in London."

The colors of the Malay fowl are White, Black, and Piles, the most common being a resemblance to the Black-red Game. In the East Indies they are often used for the pit, and are very ferocious, as has been previously noted. It is a well known fact that many varieties of the Game contain more or less of the Malay blood.

Merits and Defects of Malays. — "The principal merit of Malays is as table fowls. Skinny as they appear, the breast, wings, and merrythought together carry more meat than perhaps any other breed; and, when under a year old, of very good quality and flavor. They also make good crosses with several breeds. Mated with the Dorking they produce splendid fowls for the table, which also lay well; and with the Spanish, though both parents are long-legged, the result is most usually a short-legged bird of *peculiar* beauty in the plumage, good for the table, and, if a hen, a remarkably good sitter and mother. They have also been extensively crossed with the English Game fowl, in order to increase the strength, size, ferocity, and hardness of feather."

They bear confinement well, and their plumage is peculiarly lustrous; the hens, however, are poor layers, and their quarrelsome disposition makes them quite troublesome. It is said that a cross with the Spanish will often produce fine, large birds of black plumage, and excellent layers, as well as table fowl. Malays are often used as crosses with breeds having a deficiency of size in wings and breast, to aid in improving this deficiency; but when crossed with the Cochin, singular as it may seem, the result is said to be worse than the original. The Malay is not generally a favorite with fanciers, and will probably never be very extensively bred, either in this country or Europe.

RUSSIANS.

THIS breed was formerly extensively reared in Scotland, and quite common in some parts of England, but is now quite rare. In this country they are occasionally seen, though they are mostly of the black plumaged variety. The head is of medium size; the comb generally rose, though sometimes single. The eyes are full and bright, and the beak short, stout, and curved; its color dark horn. They have a full, heavy beard, but no crest. The body is round and compact, back broad, tapering towards the tail; breast round and prominent. The tail is devoid of long sickle feathers, so common in the cock, and is of medium size, and carried rather upright. The legs are a dark lead in color, though often of a yellowish tinge. The plumage is a greenish-black throughout, and glossy. The skin is quite yellow.

Merits and Defects of Russians. — This breed is quite hardy, and consequently easily reared. The hens are good layers, though the eggs are rather small. They also make good incubators and mothers. As a breed, they are small eaters, and therefore an economic fowl to keep in this respect. They are also a very good table fowl. The chicks mature early, grow rapidly, and breed quite true to feather.

SULTANS.

THESE pretty birds were first introduced into England in 1854, by Miss Watts of Hampstead, having been sent her by a friend living in Constantinople. They were there called "Serai-Täook," which translated is "Sultan's fowls," or "fowls of the Sultan," hence the English called them Sultans. They are considered by many to be the most beautiful of all domestic fowls, while their gentle, docile disposition cannot fail to gain the admiration and interest of those having charge of them. Like the Polish, which they much resemble in many respects, they are fond of being petted, and are in habits happy-tempered, brisk, sprightly, and tame, resembling in the latter respect Bantams. The average weight of the cock is from four to five pounds, that of the hen about three and a half pounds.

We insert the following description as given by Miss Watts: "They rather resemble our White Polands, but with more abundant feathering, and shorter legs, which are vulture-hocked, and feathered to the toes. In general habits, they are brisk and happy-tempered; but not kept in as easily as Cochins. They are very good layers; their eggs large and white; they are non-sitters, and small eaters. A grass-run with them will remain green long after the crop would have been cleared by either Brahmas or Cochins; and with scattered food they soon become satisfied, and walk away. They are the size of the English Poland fowl. Their plumage is white and flowing; they have a full-sized, compact Poland tuft on the head, are muffed, have a good flowing tail, short, well-feathered legs, and five toes on each foot. The comb is merely two little points, and the wattles are very small. We have never seen fowls more fully decorated, — full tail, abundant furnishing in hackle, almost touching the ground, boots, vulture-hocks, beard, whiskers, and full round Polish crest. They are pure white, and so beautiful that it is to be hoped that amateurs will procure fresh importations before they disappear from among existing kinds."

Such was the description of these little fowls when first imported into England so many years since, and which describes them so well to-day, showing that they have been bred with care. The beard is close around the throat, crosses the face and joins the crest, which is quite

large and full, and differs from that of the Polish by being more erect and not hiding the eyes. The beak resembles that of the Polish breeds, with large open nostrils. The neck is rather short, arched, and carried well back, and is furnished with a heavy and abundant hackle. The back is broad and slopes a little towards the tail. The body is square and deep, with a full prominent breast. The wings are somewhat large and low, which, with the vulture-hocks and short legs, give the body rather of a low carriage. The tail is very full, and furnished with beautiful long sickle feathers, and abundant tail coverts. The legs are dark blue in color, and very heavily feathered, even to the ends of the toes.

Merits and Defects of Sultans.—They are good layers, and easily reared, being quite hardy when matured, though some breeders regard them as rather delicate when chickens. They are non-sitters, and their quaint little ways make them quite fascinating as

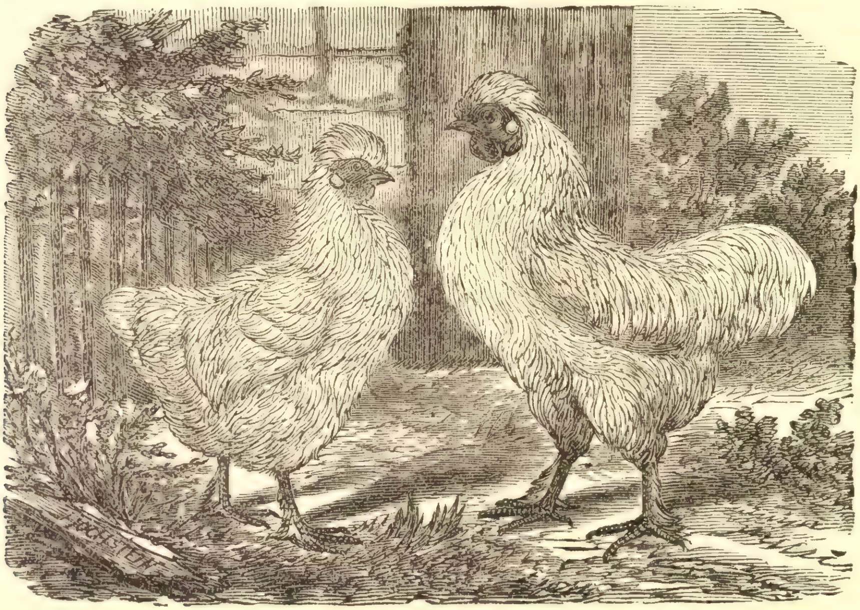
SULTANS.

pets, while their beauty of form and plumage renders them highly ornamental to any lawn. Being so small, they cannot, of course, be considered an economic table fowl, but are good layers, while as pets they are without a rival, being of a brisk, happy, docile temperament.

SILKIES.

THIS breed, sometimes called Silky or Negro fowls, have a very peculiar appearance; their plumage being so unlike that of other fowls, as to be scarcely recognized as feathers; while the skin of the fowl is a deep violet color, almost black, the surface bones being of the same hue also, which gives it rather an uninviting look when prepared for the table; the flesh, however, is very delicate and white, and superior to that of many breeds. The plumage has a soft, flossy appearance, the filaments being separated or single, and has been represented by ancient naturalists as resembling wool. In describing a certain peculiar

breed of fowls, some say "they were covered with wool, instead of feathers"; others, that they were covered "with hair like cats." These fowls are supposed to be natives of India, though some claim the origin to be attributed to China. Mr. Wright describes the plumage of the fowls as follows: "The feather of the Silky fowl differs from that of others in several respects. In the first place, both the stem and the fibres which proceed from it are very thin, weak, and non-elastic, so that the fibres have no tendency to assume a position opposite each other, but hang about in a lax and indetermined manner; and secondly, the fibrils are also very weak and thin, besides being so sparse that they cannot be seen and counted with the naked eye, or a very low magnifier; while in an ordinary feather many hundreds occupy the length of one inch. The fibrils of the Silky also extend from the main fibres at nearly equal angles, being thus destitute of the interlocking power we have just described. The consequence of these variations in structure is a loose and flossy character."



WHITE SILKIES.

Mr. Wragg, of England, a breeder of these fowls, describes them thus: "Silkies may be classed as purely fancy fowls, having little but their unique appearance to recommend them. Instead of feathers, they are covered with an abundance of white silky hair; the wing and tail-quills also being hung with long silky fringe. The skin and legs are blue, the face and comb a deep purple color, ear-lobes being slightly tinged with white. The best specimens have five toes, and are feathered on the legs. The plumage should be pure white. The cock should have a full, prominent breast; neck medium size; hackle very full, flowing well round the shoulders and on the back; saddle square, and rising upwards to the tail, which should gradually rise a few inches and then droop over. The comb is double, but is wider than long, having a lumpy appearance, with scarcely any points on the top. It should be well on the front of the head, and behind it, should be a spur or crest of feathers projecting straight out, about two inches in length. The weight of the cock averages about four pounds. The hen is rather small in proportion, weighing only about two and a half pounds. She is square and compactly built, breast being full and round, neck rather short, saddle square and well cushioned, tail almost buried in fluff, which is very abundant, and a fine

small head, from the top of which should rise a small globular crest. The general style and shape is very attractive. I consider Silkies hardy. The chickens are easily reared and generally very true to their parents. They are very moderate layers, but capital sitters. In hatching and rearing Bantams, Pheasants, or Partridges, they are unequaled." The loose and fluffy character of the plumage of these birds makes them seem larger and heavier than they really are.

Merits and Defects of Silkies.—The merits of these fowls have been mostly given in the previous descriptions. Some breeders call them good layers, others say they are deficient in this respect; but from what we can learn of them generally, they are only moderately good in this respect; their eggs are rather small, and of a delicate cream color. They are quite hardy and easily reared, and make excellent mothers to Bantams and other delicate breeds, their long, soft, and silky plumage furnishing a nice protection to tender chickens. They are, however, peculiarly susceptible to cold and wet, and should always be provided with a good shelter. Their flesh, though unattractive in appearance as a table fowl, owing to the dark color of the skin and bones, is very white and nice. They are, however, kept principally on account of their unique and singular appearance, and for mothers to delicate breeds.

DUMPIES OR CREEPERS.

THIS breed was formerly very popular in Scotland, and have been known by the name of "Bakies" and "Go-laighs" in some localities. They are at present very rare, however, especially so in this country. Their principal peculiarity is the extreme shortness of the leg, which is only about two inches from the hock joint to the ground, and gives the bird the low appearance of almost creeping on the ground. They are not uniform in color, the plumage being generally speckled, though the general appearance of the body is similar to that of the Dorking (lacking however the fifth toe). The weight of the cock is from six to seven pounds, that of the hen about a pound less.

Merits and Defects of Dumpies or Creepers.—The hens are excellent layers of large-sized eggs. They are also the best of mothers, and are a first-class table fowl, the flesh being peculiarly white and delicate in flavor. They are hardy and easily reared, and make a good cross with the "Long-legged" breeds, owing to their shortness of leg, thus reducing the stiltiness of some breeds to the "happy medium" that is something desirable.

RUMPLESS FOWLS.

RUMPLESS fowls are not only wanting in tail feathers, but their anatomy shows that the caudal projection is wanting, and also even the final vertebræ of the spine itself. This gives them a very peculiar and grotesque appearance. It is supposed that these originated from the Polish breeds, and that some of them were formerly crested with partially-developed beards, with leg feathering and vulture hocks, but these have been bred out. Their anatomy being deficient in the usual prolongation of the vertebral column upon which the tail feathers of the fowl are planted, renders them devoid of this ornamental appendage, the back part of the body being covered by a few back or saddle feathers. They

were formerly bred mainly black in color, or a mixture of black and white, but are mostly found now pure white. They have been somewhat improved by breeding, but are rarely seen.

Merits and Defects of Rumpless Fowls.—These fowls are fair layers, but the eggs are not apt to be as fertile as other breeds. As sitters and mothers they do very well,

RUMPLESS FOWLS.

while as a table fowl they are about of an average quality. They are also considered quite hardy, but we doubt much if this breed ever becomes much of a favorite, since the absence of the tail is really a deformity, and a tailless bird can never be called handsome. They are curiosities, and will probably be bred as such more than for any prominent excellence or superior merit.

FRIZZLED FOWLS.

THE term "Frizzled" is applied to fowls the plumage of which has a tendency to curl backward, "as if the bird had been stroked the wrong way," as some have described it, and not only that, but to curl up at the ends, especially in the hackle and saddle feathers. This feature is most prominent, though the plumage throughout is involved. This is not true of the tail feathers, although the webs even of these are loose and disconnected. They are of diverse colors, though the white and black varieties are the most common. The chicks feather slowly, and show a tendency for the curling plumage as soon as it is perceptible. The combs are generally rose, though sometimes single. They breed true to feather, seeming to possess peculiar power to reproduce the frizzled plumage. In form they are long-

FRIZZLED FOWLS.

bodied, square and plump, with a prominent, wide breast and broad back. The neck is rather short and well curved; the tail of medium size, and carried rather upright. The legs are of medium length; the carriage quite sprightly and animated. This fowl is common throughout Southern Asia, Java, Sumatra, the Philippines, and Ceylon. It is also found in the West Indies.

Merits and Defects of Frizzled Fowls.—These fowls attract great attention at poultry shows on account of their very singular appearance, and are probably bred more for their extreme oddity, than any other reason, although they possess some very excellent quali ties as fowls. They are very early layers, as they are usually through the moulting process sooner than other breeds. They are said, by those who breed them, to be also very good

egg-producers, as well as an excellent table fowl; the meat being very white, and the bones small. They are also good mothers, the peculiar character of their plumage seeming to keep the eggs and chicks warmer than the ordinary feathering. The chicks feather so slowly, however, that they require to run longer with the hen than most breeds.

THE GRAY LIVONIAN FOWLS.

THIS breed of fowls is a native of the province of Livonia, Russia, and much resembles the American Dominique in its plumage, which is of a gray color, barred similar to that of the latter. It is large and deep-bodied, with a broad, prominent breast. The comb is low and broad, with the projecting spike; the beak dark, short, and strong, and remarkably hooked, with the large cavernous nostrils peculiar to the Polish varieties. The legs are of a bluish leaden color; the carriage is upright, bold, and proud. They are said to be very popular and much preferred to other breeds by poulterers in Lithuania, Courland, and as far north as Finland, as they are exceedingly hardy, and are possessed of a stamina and constitution requisite to a cold climate. The hens are darker in color than the cocks.

Merits and Defects of Livonians.—It is said that Denmark, which recently exported over a million dollars worth of eggs, is especially favorable to this breed. They are excellent egg-producers, extremely hardy, and suited to a severe climate; they are consequently easily reared. Although not possessing much beauty of plumage, they are otherwise very desirable, the flesh being very tender and delicate in flavor. We doubt not this breed would be a very valuable acquisition to our already numerous varieties, being especially adapted to our northern climate.

BANTAMS.

THESE diminutive specimens of poultry cannot fail to attract attention wherever seen, whether in the yard or at the poultry shows, which have become such an important institution in this country within a few years. They are also very popular among poultry keepers, their quaint little ways, proud and strutting manner, as well as gentle and tame disposition, rendering them not only comic, but interesting tenants of the poultry yard. The Bantam cock is the very personification of happiness and conceit in feathers, and, as is often the case with *some* small *human* specimens, bustles about with the air of self-importance and superiority, combined with quick resentment at the slightest imagined insult or invasion of his rights, in a manner that is intensely amusing, and as though he considered himself the largest and most important of all living creatures. More especially is this true of the Game Bantams, which never hesitate to attack any fowl, no matter how many times larger than himself he may be. These little birds, with their ludicrous ways, would pay a fun-loving person for their keeping, for simply the amusement they afford, even if for no other reason; but they are really a profitable fowl, and amply repay for all their care and expense. They require but little room, are contented in confinement, and eat almost nothing compared with larger breeds, while they are very good layers.

We append the following on "Bantams for Children" which has been going the rounds in the Agricultural and Poultry journals: "Show us the boy who is fond of pets and takes especial good care of them, rearing the young successfully year after year, and we can then

JAPANESE BANTAMS.

Owned by W. R. Andrus, East Orange, N. J. (Weight of the cock represented, 24 ounces; weight of hen, 15 ounces.)

point out to you one who will be successful as a stock-breeder in future years, whether he breeds poultry or larger stock. To many children, girls as well as boys, pets of some kind are a real necessity; and the love for pets should be fostered by the parents to the extent of their ability. Aside from the pleasing appearance of pets, there is a real benefit which you confer on your children by giving them pets to care for; for it engenders habits of usefulness, and gives them something to care for regularly, which habits cannot be formed too soon. This point is not sufficiently considered, though it is worthy of mature consideration.

No neater, prettier, or more attractive pets can be given to the little ones of the household to care for, than Bantams; for their small size and handsome plumage and proud ways, make them objects of unfailing interest. They can be kept in a small yard, if necessary, and do not require very great care. They are hardy, and many an enterprising boy has put a number of stray dollars in his pocket from the sale of his surplus stock — money which he prizes far more than that which he did not earn by his own exertions. A boy must learn to *contrive* as well as work, and *save* as well as earn, or he will be good for nothing."

The principal varieties of Bantams are Game (which includes almost every variety of the Game fowl), Rose-combed Black, Rose-combed White, Golden Sebright, Silver Sebright, Nankin, Japanese, Pekin or Cochin, and Booted White; besides these, there are other varieties less common, such as the Cuckoo Bantams, etc.

Game Bantams. — These are diminutive specimens of the Game fowls, which combine the beautiful outlines and plumage of the latter breeds, with the small size of the Bantam, and were produced by crossing the English Game fowl with the Bantam, and repeatedly selecting for stock-birds those chickens which most closely resembled the Game, thus breeding in-and-in, until the desired size was reached. This creation, as it were, of the Game Bantam breeds, is one of the most striking illustrations of the breeder's art, and the triumphs that can be attained in the direction of change and the formation of new breeds. The leading varieties of Game Bantams are Black-breasted Reds, Brown-breasted Reds, Dorkings, and Piles, although nearly every variety of the Game breed is represented in these Games in miniature, and which closely resemble their larger brethren in all points except size. The average weight of the full-grown cock is from twenty-two to twenty-six ounces, that of the hen about twenty ounces. In breeding these little birds, the great points aimed at are the general shape or contour, good feathering, and color. To avoid repeating these points, the reader can refer to the description previously given of Game varieties. which will be found sufficiently definite for all purposes.

For breeding good Game Bantams breeders of experience advise selecting and mating the birds early in January or even earlier, with one cock to about four hens that are from eighteen months to two years old, and one can *then* commence setting the hens about the last of February. They will generally hatch a little sooner than the larger breeds, and usually on the nineteenth or twentieth day, if the hen is a good sitter. They can be hatched all through the spring until the first of June, and—as our opinion—we should say it were advisable, in our northern climate, to delay hatching till the last of April or first of May for such diminutive chicks. The eggs hatch better on the ground, with a little hay or straw for lining, since the moisture thus derived from the earth seems to be beneficial to the eggs. In very warm weather many breeders sprinkle the eggs with warm water each day for two or three days previous to hatching; that is, beginning about the fifteenth or sixteenth day of the sitting. The chicks will not require food for the first twenty-four hours after hatching, and should then have boiled egg chopped fine given them, or a little custard of eggs and milk mixed with soaked bread crumbs. The chicks are quite hardy, but the hen should be confined in a coop of good size until they are at least five weeks old, and should have access to fresh grass, fresh earth, and fresh water. We do not approve the recent idea of some breeders of the "no water" principle for fowls of any kind, whether young or old; they

need it as well as other creatures, and we believe the Creator provided it as much for them as other living things. One not accustomed to the care of fowls would be surprised at the quantity of water fowls will drink when having free access to it, and such fowls always seem to thrive best and be the most free from disease.

Game Bantams are said to be quite hardy, and as table fowls, what there is of them is exceedingly delicate and fine flavored, making a very good substitute for partridges. The hens are quite good layers, good sitters, and the best of mothers, tenderly caring for their chicks, and defending them against all intruding enemies of the poultry yard.

Rose-Combed Black Bantams.—This variety, sometimes called the Black African Bantam, is a perfect specimen of the Black Hamburg fowl in all respects, except size, also the points of the wings drooping; having the same general contour, the rose comb with its terminating spike behind, white ear-lobes, plumage, and color of beak and legs.

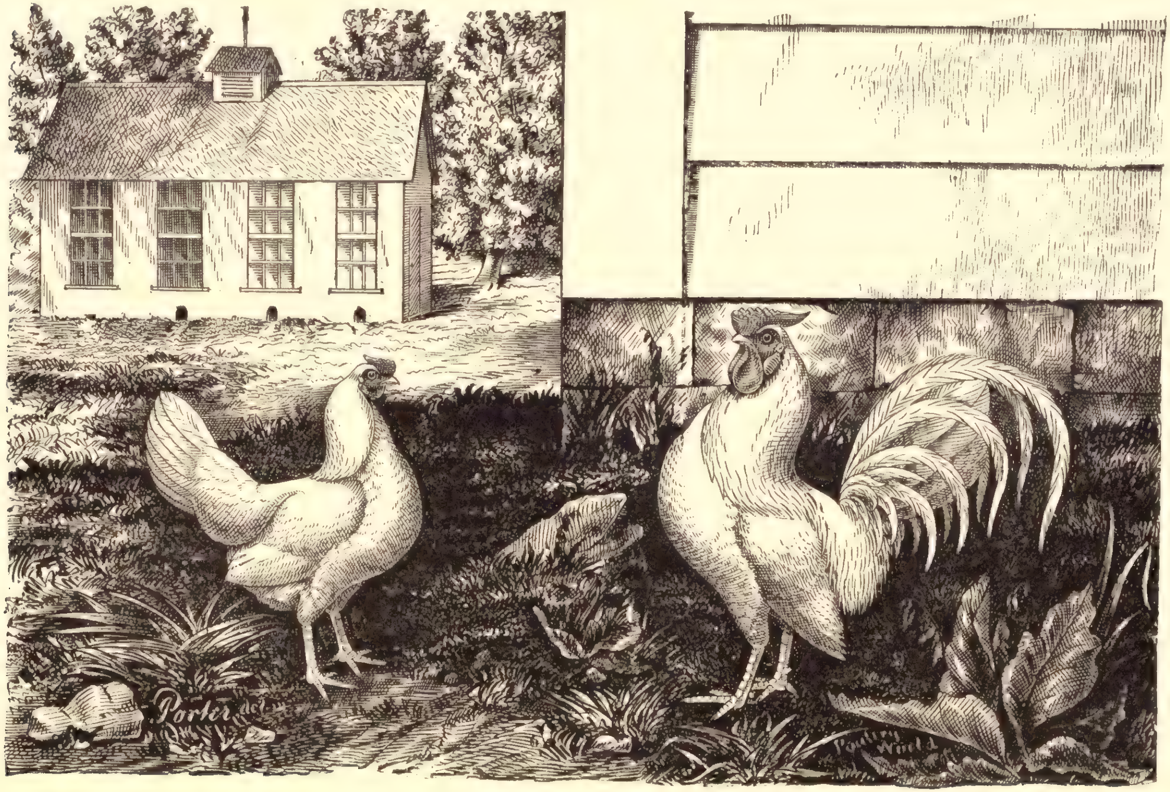
The size of the birds varies, of course, somewhat; the cocks will weigh from fourteen to twenty-eight ounces, and the hens from twelve to twenty-four ounces; cocks from eighteen to twenty ounces being usually regarded as the best birds. The disqualifications for this variety of Bantams, given in the Standard, are: "Cocks weighing more than twenty-eight ounces; hens weighing more than twenty-four ounces; cockerels weighing over twenty-four ounces; pullets weighing over twenty-two ounces; red ear-lobes; feathered legs; legs other than black or deep leaden blue; combs other than rose; natural absence of spike; birds not matching in the show-pen; crooked beaks; wry tails, or any other deformity."

This little bird has a very upright, strutting carriage, his neck curving backward so as to bring the head quite near the tail. The back is short, the breast round and quite prominent, and the body plump and well proportioned. The tail is quite full, with long sickle feathers, which are carried well up towards the back of the head. The entire plumage is a glossy black, with greenish reflections. The legs are black or dark leaden blue, and the beak also black or nearly so.

They breed quite true to color, and are among the best for laying qualities among the Bantam race. The egg is large in size in proportion to the size of the bird, and peculiarly delicate in flavor, the yolk being large in proportion to the white, and not as strong in flavor as the eggs of larger breeds; they are said to be particularly prized by invalids. These birds make very pretty pets. The chicks are said to be rather delicate when about five or six weeks old, owing to the rapid growth of feathers, being nearly in full plumage at three months of age. Mr. E. Cambridge, an English breeder, says of them: "They do not require a large run, and will do well on a lawn or in a kitchen garden, the hen being cooped. A farm-yard would be a ready-made *grave-yard* for them. Egg and bread-crumbs, and barley or oat-meal is the best food for them at first; afterwards grits occasionally, which they are very fond of. Any artificial or forcing food I consider bad for any fowl, but especially Bantams. When about four months old I separate the cockerels and pullets. By this means several of the former can be kept together, whereas, even at that early age, being very fussy and pugnacious, they would fight and disfigure one another if left with the pullets."

In selecting for stock-birds, it is very desirable that the most perfect specimens in all respects should be taken for this purpose, since a single slight deformity or defect is quite liable to be transmitted to the progeny. This is one of the oldest of the Bantam varieties, and has been greatly improved within a few years, by careful breeding. As they now breed very true to color, and have attained the desired shape, carriage, and size, we can scarcely perceive how any additional improvement in them could well be made.

Rose-Combed White Bantams.—This class of Bantams should be similar in general respects to that just previously described, except the color of the plumage, which is pure white throughout. The beak and legs, however, should be in color white or yellow, both



ROSE-COMBED WHITE BANTAMS.

being admissible; the ear-lobes should also be red instead of white, as in the Black; these being the only essential differences in the two varieties. In all other respects, consequently, what we have said of the Black Bantams will apply to the White.

The points, as given above, are in accordance with the American Standard, but we find that the English Standard requires for this breed *dark* legs and beak, and *white* ear-lobes, making the only essential difference between the two varieties—Black and White—the color of plumage. We certainly think "Brother Jonathan" shows a decidedly better taste in this respect than "John Bull," since, with a pure white plumage, the contrast of the bright-red ear-lobes would produce more of beauty in the effect than the white, which would give a sickly appearance to a white-plumaged bird. We admit that white ear-lobes, with *black* plumage, add much to the beauty of a fowl, and with the bright-red wattles and comb make a very pleasing contrast. It is doubtless a matter of surprise and amusement to many of the uninitiated in the mysteries and interests of poultry breeding that fanciers should be so particular about the minor details of a fowl, such as the color of an ear-lobe or the tint of the beak; but when they come to understand the subject more fully, they will find that it is only by the greatest care and patient, persistent efforts in all such seemingly minor matters that our to-day valuable and beautiful breeds of poultry have been produced, and great credit is due those who have accomplished such truly wonderful results!

Those birds having the points of the wings drooping so as nearly to touch the ground are considered the most beautiful and desirable. Like all the Bantam varieties, they are very pretty pets.

Booted White Bantams.—This is one of the oldest known Bantam breeds. They are very tame and hardy, and also exceedingly happy and contented in their dispositions. One writer has said of them: "They are the gamiest little fellows imaginable; pick up a cock from the yard, and he will crow in your very hands in the most defiant way. They are very prolific, though the eggs are not much larger than pigeons' eggs; and the hens make admirable sitters and mothers; but sometimes the length of the hocks makes them roll the eggs from the nest when leaving it. Three little hens I now have, with their chickens are making the most exemplary mothers." They are also harmless in a garden, or at least can do but very little injury, even in a flower garden, the long feathers on their legs making it very difficult for them to scratch; for this reason they would be just the breed for one to keep who had only a small yard or garden to keep them in, and consequently had no run for larger fowls.

The smallest specimens are considered the most desirable; their manner is very pompous, the carriage being upright and strutting, carrying the head well back toward the tail. The beak and legs are either white or yellow, though the white is preferred. The comb is bright red and single, the neck curving well back, and the hackle pure white, like the entire plumage. Their breast is round and carried quite prominently forward, while the body is short and compact. The wings droop somewhat; the tail is furnished with nice, long sickle feathers and is quite full and carried upright. The legs should be heavily booted and hocked, the latter feathers nearly touching the ground; the more heavily the legs are feathered the better. It is said by those most familiar with this breed, that they are quite liable to get sunburnt, like most white-plumaged birds, and when kept exposed to a strong sunlight without any shade, the neck hackles will turn yellow, which, of course, greatly mars their beauty. This can, however, be obviated, by having trees and other shade for their protection.

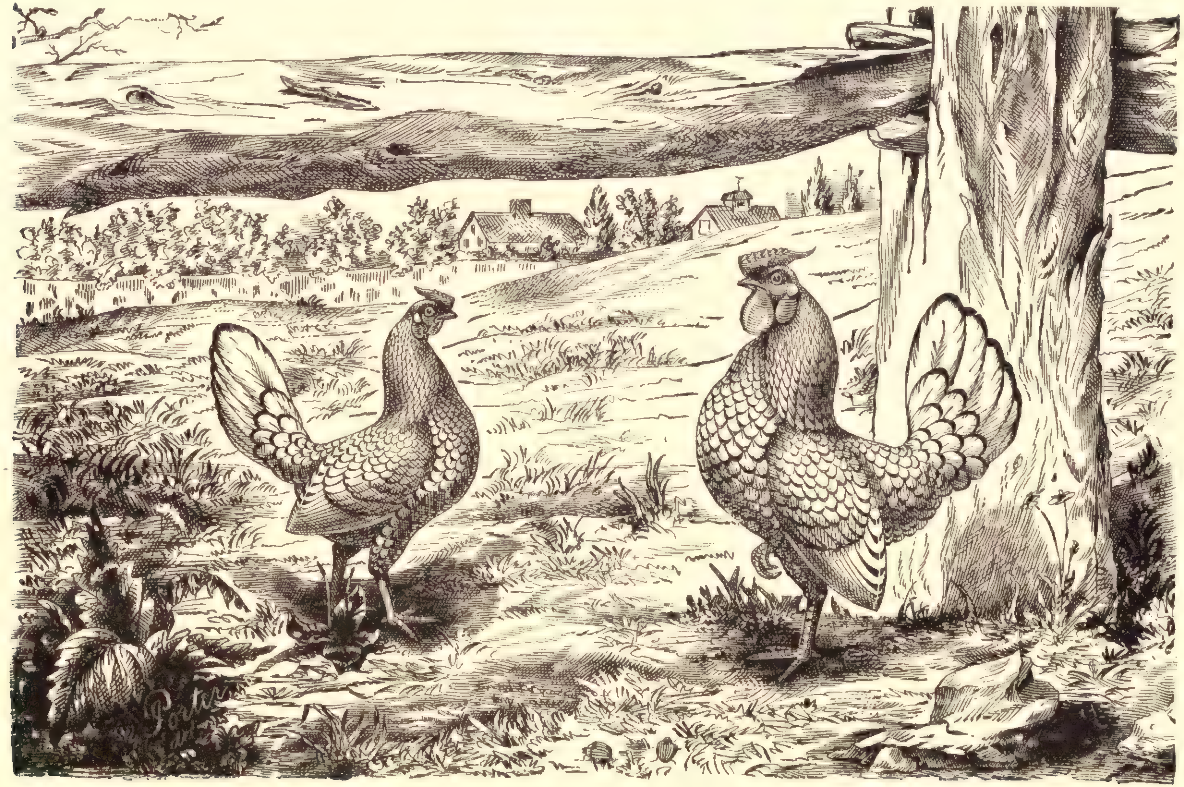
Golden Sebright Bantams.—With regard to the origin of this beautiful little fowl, as well as the Silver Sebrights, we can give no better account than that already given by Mr. Wright in his Book of Poultry: "The beautiful Gold and Silver Laced Bantams, also very commonly called Sebright Bantams, are perhaps the most extraordinary proof of what can

be done by careful breeding that could be found within the pages of this work. So entirely is every feature the result of art, and so well did Sir John Sebright (known as a skillful breeder of Shorthorns and other animals, as well as of poultry) keep his secret as to the process of manufacture, that for a long period the most erroneous and contradictory accounts are current as to the origin of these beautiful breeds, some affirming that they had been imported from the East. After the death of the right honorable baronet, however, truer accounts obtained from various members of the family, began to appear; and in the *Journal of Horticulture* for 1865, was published the fullest and most detailed account of the matter we have yet seen, as follows: 'It was about the year 1800 that the late Sir John Sebright first began to fashion the Sebright Bantam. The cross was between some common Bantams and Polish fowls. These were bred in-and-in until the required marking and size were secured.

Sir John then accidentally found a short-tailed Bantam cock in the country where he was traveling. This short-tailed bird he in-bred with his newly-manufactured Bantams, thereby giving their progeny the present form of the short tail. In the *Poultry Chronicle* it is stated that Sir John obtained a buff-colored Bantam hen; she was very small indeed, with clean slate-colored legs. On the same journey he purchased a cock rather inclined to red in color, destitute of sickle feathers, and a hen-like hackle; and also a small hen resembling a Hamburg. He afterwards had a white cockerel from the Zoölogical Gardens, by which he made his Silvers. This description of the origin refers back before the laced marking was achieved. They were then known as 'Pheasant Bantams.' These birds generally have a rare comb, that is, square in front, and terminating in a spike behind; the ear lobes are white; the wattles bright red, the neck is well arched, and the head carried well back, giving a very pompous, strutting carriage to the body; the breast is full and prominent; the wings carried quite low, the ends nearly touching the ground; the tail is entirely free from sickle feathers, similar to that of the hen; it is square and expanded, the feathers being broadest towards the ends. The hackle feathers of the cock are similar to that of the hen, as is also the entire plumage, being quite compact and close. The beak and legs are dark, the latter free from feathers and a slate blue color.

The entire plumage, including the feathers of the wings and tail, is a rich golden yellow, each feather distinctly and evenly bordered or laced all around with a narrow edge of black, which makes a most beautiful plumage; while their sprightly and pompous ways, their tame and familiar manner makes them very pretty pets. The great drawback to this breed is the failure in hatching, often only a small number of chicks being produced from a large number of eggs. They produce a large number of eggs, however, and are considered quite as hardy as the average Bantam varieties. The young chicks should not be overfed, many being killed by too great kindness in this respect. They should be fed at first with custard, oatmeal, boiled eggs chopped fine, boiled rice, and curd made by scalding loppered milk and draining off the whey; though they should be fed very sparingly of the boiled eggs for the first few days, it being rather strong food for them when first hatched. For this beautiful bird, originated in England more than eighty years since, great credit is due Sir John Sebright. He has not only given us a bird of exquisite beauty and form, size, and color, but has shown the world what the breeder may accomplish by patient perseverance and skill.

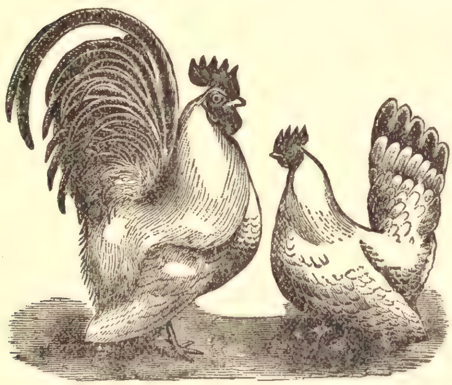
Silver Sebright Bantams.—This variety is precisely like the Golden Sebrights, previously described, in all respects except color of plumage; that being a rich golden yellow, with each feather laced with a narrow border of black, and this in plumage, being a silvery white with each feather even and distinctly bordered with a narrow edge of black, as shown in the cut, which represents birds bred by Mr. Gamerdinger of Columbus, Ohio, even the wings and tail feathers should have this peculiar marking, which is extremely beautiful in effect. The beak and legs are dark as in the Gölden variety. The feathering of each is



SILVER SEBRIGHT BANTAMS.

compact and close, the cock, like the hen, being devoid of hackle, saddle, or sickle feathers. The ground color should be clear in each variety, and whether Gold or Silver, the lacing should be narrow and distinct, and never spotted. The eyes are large and bright, and the carriage vain and pompous, strutting about in the most ludicrous manner.

Japanese Bantams.—This breed, though rare in this country, is becoming quite a favorite where well known, and we doubt not that it will soon become as common as many of our most familiar breeds. As the name indicates, they are imported from Japan, and seem to be easily acclimated and quite hardy, also easily reared, while their appearance generally is so unique and beautiful that they cannot fail to attract admiration, even from the most practical and prosaic. The plumage of these birds is pure white, except the tail, which in the cock is a rich black, each feather having a narrow edge of white distinctly marked around it, similar to the Silver Penciled Hamburgs, which gives a beautiful contrast with the glossy black. The tail is also very large, compared with the size of the bird, is full and upright, nearly touching the back of the head, and flows in a sweeping semi-circle. The sickle feathers are very long. The head is rather large, the comb is bright red, standing erect, and evenly serrated; the ear lobes and wattles are also bright red; the neck is rather short and carried well back; the breast quite prominent and full, body short and compact, and the wings large and long, the points carried drooping. The back and legs are yellow, the latter quite short and free from feathers. The plumage is pure white except the tail. These little birds breed true to feather, are quiet and easily tamed, while their beautiful plumage and proud carriage renders them exceedingly attractive, and highly ornamental to any yard or lawn. The eggs, though small, are very delicate in flavor. The originals from which the full page cut of these birds was made weighed,—cock, twenty-four ounces; hen, fifteen ounces.



Nankin Bantams.—This is an old, and now very rare breed, they being seldom seen at shows. The color of the hen is similar to that of the Buff Cochin, the hackle being darker, also the tail feathers tipped with black. The color of the cock's plumage is considerably darker than that of the hen, the tail being a glossy black, and quite full and sweeping, though some very fine specimens have the tail of a chestnut or copper-color shading into black; but the jet black is preferred. They vary more than most varieties, as the hen is often of a light canary color, with tail of a rich brown, shading into black at the end. The legs are unfeathered, and usually dark in color, though sometimes white; the dark, however, are preferred. They are said to be very tame, excellent layers of eggs large in proportion to their size, and very careful mothers. The smallest specimens are considered the most desirable.

Pekin Bantams.—This variety, sometimes called the "Cochin Bantam," is a native of China, and was first shown in England in 1863; the progenitors of those then exhibited having been stolen from the Summer Palace at Pekin during the Chinese war, when—during the Anglo-French Expedition in 1860—that palace was sacked.

It is, size excepted, like the Buff Cochin, not only in color, form, feathering of the leg, and abundant fluff, but in the other characteristics. The legs, however, are shorter in proportion, than the large breed. They are very tame and docile, and, like all the Bantam

breeds, make excellent pets. It is said that they are much attached to each other, though they seem shy of other breeds. They are fully fledged at two months of age, and breed very true to color. They are contented in confinement, but seem to thrive best when they can run about and get worms and insects. They are considered rather delicate, which has probably resulted from interbreeding, necessitated for lack of new blood from fresh importations. They have increased in vigor by crossing with other feather-legged Bantams, and then breeding back to the pure strain. It is quite unnecessary that we should give a minute description, as they are but diminutive Buff Cochins, and that breed has already been fully described.

Merits and Defects of Bantams. — We have referred so frequently to these points in giving descriptions of the several varieties, that to write at length under this heading would be a repetition of what has already been stated; therefore we will summarize briefly as follows: They are the most interesting and gentle of pets among the feathered race, while their pompous and quaint little ways, combined with their beautiful form and plumage cannot fail to awaken real interest in those having their charge. They are almost harmless in a garden, even where choice flowers are cultivated, and they do much good in ridding it of worms, grubs, and insects.

Though small, they are very dainty eating, and are a good substitute for partridges. Most of the varieties are good layers, and the eggs are very delicate, and much prized by invalids, being free from the strong flavor found in those of most of the large breeds. They eat but little, consequently are economic fowls to keep in this respect, and they require so little room that they can be kept where other fowls could not. A house two feet square for them to roost and lay in, and a small garden for a run, is said to be sufficient room for five or six of these little birds. The Game Bantams are the most hardy.

The main point in breeding Bantams is to keep them small, and care should be taken not to over feed, or to give too much food that is bone-making in its tendency. The chicks when first hatched should have a little extra care to keep them warm and dry, for at least the first two or three weeks; after that they are as hardy as other breeds. Some breeders resort to late hatching to preserve the small size, but this has been found to injure the plumage, which in the development of the tail of the cock, renders the bird almost worthless as far as beauty is concerned. We believe it is the general verdict of breeders that have had experience with Bantams, that for the amount of care and food, they furnish as much in return as any of the larger breeds, while as pets for children there is no more suitable or pretty fowl.

GENERAL MANAGEMENT OF POULTRY.

IN order to make poultry raising profitable, certain things are essential, such as proper buildings, sufficient range, suitable food of proper quantity, access at all times to pure water, etc. Farmers who permit their poultry to pick up a precarious living, roost in the winter in the apple trees, and care for themselves generally, as was formerly the practice in many localities, cannot expect to attain the highest success in poultry raising. In such cases eggs were rarely supplied to the family in winter, while the hens stole their nests in summer, which were perhaps not found until the eggs were past being suitable for use, or the hen appeared with her family of chicks about the farm house, this frequently occurring so late in the season that the chickens could not possibly be of any profit to raise. How often have we known the good housewife, standing in some farm house door, with sleeves rolled up to the elbows, and hands whitened with flour, call to "one of the boys" to hurry and look up a nest, because eggs were wanted at once to finish the baking. And so the search would commence, ladders and scaffolds were climbed, hay mows searched, sheds and shed lofts carefully scrutinized. An opening under the barn would be utilized as a means of access to the wide range afforded under the barn floor, or perhaps one or two boards would be taken up in the barn floor to admit of access to this place so delightful often to a hen, as a place of security for secreting her nest. Piles of old rubbish would be peered under, every currant bush and place of security in the kitchen garden searched, until covered with cob-webs, dust, and hay seed, and tired out with the effort, the task might perhaps be rewarded with a few fresh eggs, but quite as frequently with those past their state of usefulness as an article of food.

Intelligent farmers of the present day have learned that there is an easier and more profitable method of managing poultry than this, and so on the best kept farms, those where the general appearance is indicative of the most thrift and judicious management, we see a better system adopted, where the commodious and tasty outbuildings of the farm have somewhere ample provisions provided for the comfort and care of the poultry, as well as the other domestic animals on the farm. A poultry house need not of necessity be expensive, but it should be comfortable and provide warm quarters for the poultry in cold weather, and shelter from the storms at all times. But the rearing of fowls need not necessarily be restricted to the farm. A constant supply of fresh eggs may be had by keeping poultry, whether on a farm, or even a village or city lot. With the average farmer, fowls are permitted to have free range about the farm, where they obtain a large portion of their living, especially insects, grass, and a variety of other food. They are scavengers with respect to clearing the premises of insect pests, grasshoppers, beetles, grubs, etc., sometimes proving very useful in aiding the farmer by exterminating the beetle or potato bug from a potato field; some hens, however, will not eat the latter insects.

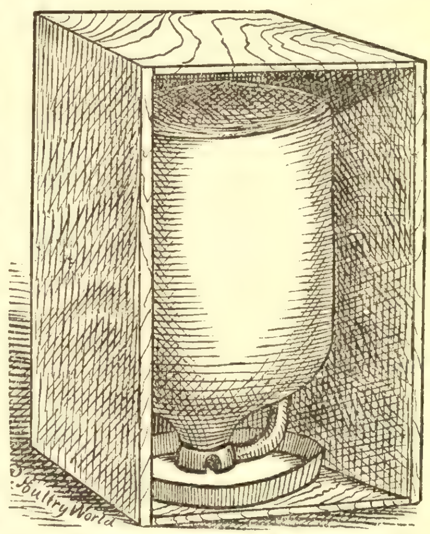
We know of nothing better for a farm garden in ridding it of insects and small worms, than to have a chicken coop located near its center, where the young chicks can forage all they wish. The chickens cannot scratch enough to do mischief in that way, while the hen, being confined within the coop, will keep a sharp look-out for danger, and give any necessary call of alarm. It is an interesting sight to see a flock of hens follow a fresh-turned furrow and pick up the worms, beetles, etc., that are distributed throughout the soil, none escaping their keen eye. A flock of chickens are also of great service in an orchard, in freeing it from injurious insects. A gentleman in France, owning a fine estate, planted near his mansion large orchards containing all the choice fruit trees that could be acclimated, among which were about three acres in plum trees, which were healthy looking, grew finely, blossoming every spring, but owing to the ravages of the curculio the fruit never came to maturity.

Becoming disgusted, he turned this plum orchard into a chicken yard, leaving the plum

trees for shade. To his surprise, the following season the plum trees were heavily loaded with full, matured ripe fruit. The poultry had completely exterminated the curculio, which had previously ruined the crops of plums. We recommend this experiment to those who have failed in raising plums on account of this pest.

There are many breeds of fowls that bear confinement well, and are hence adapted to a limited enclosure, having perhaps the run of a small yard; but in such cases, they should be supplied with green food in summer, together with a certain amount of meat, to make up for the lack of insect food to be obtained in having a free range. Other conditions being equal, that poultry will thrive best, that has considerable range. The surroundings for poultry should always be kept clean, and the poultry house free from vermin of all kinds. Pure air should be supplied by proper ventilation, while the water should be fresh and clean, and the food at all times of suitable quality. Never throw grain, or any food for them, in a dirty place, where, in order to obtain it, they must also take up sand or dirt. Put the food in a clean place, whether in troughs prepared for feeding or not, and so arrange their watering tank that the water cannot become foul by their getting their feet into it, or by other means. A very cheap and convenient drinking fountain can be made by filling a three-gallon jug with water and turning it mouth down in a suitable shallow dish, provision being made for properly supporting the jug. The accompanying cut represents the idea very accurately.

When confined with a limited yard for exercise, it will be always well, if practicable, to permit them a run for an hour or so just at night, when they will not wander far from their quarters. They will greatly enjoy this freedom, and it will do them much good, giving them the opportunity to catch a few insects, eat green food, and obtain considerable exercise.


DRINKING TANK FOR FOWLS.

Care of Poultry in Summer.—Although when having a free range in summer, poultry will not require as much care as when kept confined, still they should be fed with regularity, and have constant access to clean, fresh water. When kept in limited quarters in towns and villages, fowls will need fully as much attention in summer, if not more, than they will in winter. In summer, vermin are apt to be more troublesome than in cold weather; and these must be avoided. The pens and yards will require considerable care to be kept clean; the poultry building should be well ventilated; clean, fresh water must be supplied, and wholesome food in variety furnished in such quantities that it will not become stale and unfit to be eaten.

In feeding, whether in summer or winter, the amount of food given should always be such that it will all be eaten up clean, and nothing left over. Poultry will not furnish a good supply of eggs unless they are kept healthy; and they will not remain healthy unless the proper sanitary conditions are observed. To attend to all the essentials requisite in maintaining these conditions, will require some time and labor, but there is no business whatever that will result in profit or success, without this.

Eggs are apt to fall off in very hot weather in summer in consequence of the unfavorable conditions of the season, unless these unfavorable conditions are met and overcome by proper care. The best economy, then, demands that the poultry yard and house have daily care throughout the hot weather. The droppings under the roosts and in the pens should be daily removed, and the perches occasionally washed with kerosene oil, or smeared with lard

WHITE COCHINS.

and sulphur, mixed. Dust baths should also be furnished, in which they may scratch; common soil, road dust, or coal ashes will do for this purpose. If practicable, the hens should be permitted to leave the yard for an hour towards night, thus giving them the benefit of exercise, and scratching in the garden among the grass or fruit trees. While they are enjoying this exercise, a portion of the yard should be spaded up, so that they can have access to fresh earth worms and grubs, which they will be busy in finding early the next morning. When kept in confinement, fowls should also have fresh grass thrown into the yards, since they require considerable green food. The feed should be varied and frequently changed, consisting of corn, oats, buckwheat, wheat, barley, mush, scraps from the table, mashed boiled potatoes, meat scraps, etc. Green food is also relished by them, such as green turnips, beets, cabbage, and occasionally onions chopped fine. The latter are very healthful and are much relished by hens. If fed to them more frequently than once a week or ten days, however, it will have a tendency to give the eggs an unpleasant onion flavor. They should always be supplied with ground shells, broken bones, and plenty of gravel. Coal ashes containing small clinkers may be furnished them, as well as bits of broken plaster. When thus cared for, there will be no lack of eggs during the hot weather, and the results will well repay for the care and labor bestowed.

Care of Poultry in Winter.—Whether a large or small number of eggs be supplied by the hens in winter, depends on the care they receive. Mr. Alexander Hyde says on this subject: "In the summer, hens that are allowed a free run of the farm can scratch for a living, and generally can pick up enough not only to keep soul and body together, but also to develop new life in their ovaries. Not so when the ground is frozen and covered with snow. Biddy finds scratching at this season a hard business. She now requires more food to keep up animal heat, and to expect eggs from her without furnishing her a comfortable room and suitable material for manufacturing them, is as unreasonable as it was in Pharaoh to exact the regular toll of bricks from the Israelites without furnishing straw with which to burn them. The profit from hens is small if they lay only in summer, and make no returns in winter.

The complaint of the old woman who said, "My hens are good-for-nothing critters; when eggs are cheap they lay, and when eggs are dear they lay nary a one," had some foundation, but the trouble was not with the "critters." Hens are just as ready to lay in winter as in summer, provided the conditions are all right; and as eggs bring double, if not triple, price during the cold season, the net income may be made as great at this time as in summer.

The question then returns, what are the conditions that will make hens profitable in winter? There are only two. The first is a warm, well-lighted, well ventilated, and every way comfortable hennery. The hen is a native of a warm climate, and our cold air and frozen or snow-covered ground are not congenial to her. When compelled to wade in the snow she treads lightly, often holding up one foot to warm it in her feathery muff, and if left to roost upon a tree, she turns her head windward, so that the breeze may not ruffle her feathers, and the careless farmer may think she is comfortable, but frozen toes and combs are often the result, and if any one expects his hens to give their energies to the manufacture of eggs, when they are all required for fighting the frost, he expects too much. The hennery need not be an extensive structure. Much useless fancy work is often expended upon it, as if hens, being beautiful animals, must needs demand a beautiful house; but they know no difference between a shanty and a palace, and will lay just as many eggs in a hemlock box, as in one made of mahogany.

Let the rich poultry fanciers spend as much as they please upon biddy's house, but the farmer who has an eye to profit has no occasion to invest much capital in poultry fixtures. The most successful hennery I ever saw was in the basement of a shed built on a side hill,

facing the south, and having a well-glazed front, with tight walls on the north, east, and west. The apartment was simple enough to suit the taste of Diogenes, but cozy and comfortable enough for a prince of the Brahmas, or a princess of the Cochins. The windows on the south side were made to drop from the top, so as to let in fresh air, and a wooden tube a foot square, leading to the roof, furnished an outlet for the foul air. The sides and ceiling were plastered and whitewashed, and the floorless bottom was well covered with coal ashes and sand. Here the tender White Leghorns lived, loved, scratched, laid eggs, cackled, and slept with no frost to nip their combs or crack their eggs.

Such an underground room has greatly the advantage over a hennery built, as so many are, exposed on all sides to the cold winds. It is almost impossible to keep the latter warm enough without a stove. The yard of the hennery above referred to was simply the barnyard, to which the hens had access at all times during summer, and every pleasant day in winter. There is great economy in letting hens run in the barnyard. They take to the dunghill so naturally that they are sometimes called dunghill fowls. Here they find many grass seeds, not a little partially digested grain, and what is most congenial to their taste, lots of maggots.

This leads me to say that the second essential condition for the winter profit of hens is suitable food. Exactly what raw materials, and what proportion of them are required for the manufacture of eggs, may be learned from an analysis of the egg itself. That of the average hen weighs 1,000 grains, and consists of the shell, weighing 100 grains, composed of carbonate of lime; the yolk, weighing 300 grains, composed of water, albumen, and oil, or fat; and the white, which, aside from its water, is pure albumen. The amount of water in a fresh egg is about the same as in fresh meat—from two-thirds to three-fourths of the whole. Prof. Johnston gives the components of an egg, aside from its shell, as follows: Water, 666 grains; albumen, 127 grains; fat, 94 grains; ash 13 grains.

It will be seen from this that an egg is really animal food; indeed, it is richer in fat than fat beef. That it has all the components of an animal is also manifest from the fact that a chicken (bones, feathers, flesh, every part) is made from it. The food, therefore, of a hen expected to lay eggs, must be such as will build up an animal. All the grains contain fat, gluten (the same chemically as albumen), lime, and other salts, but not in the same proportion, or so chemically combined as in an egg. It is therefore very essential that the food of an egg-producing hen should be animal to a certain extent. In the summer, hens running at large pick up a vast number of insects, either perfect or in a grub state, and these satisfy their wants; but when shut up, either summer or winter, some substitute for insects must be supplied. The refuse bones and meat of the house will often be sufficient; if not, lard or beef scraps, fed in connection with grain, will make hens lay abundantly. The most convenient animal food for hens is found in what is called animal meal. This is made from the refuse bones, blood, and meat of our large slaughter houses, being first steamed under high pressure, then dried and ground together as fine as meal. A quart of this animal meal, mixed with three quarts of equal parts of corn-meal and wheat bran, and wet up with skimmed milk, makes a mixture that will furnish hens with all the materials they want for manufacturing eggs, unless it is carbonate of lime. This is best furnished in the form of pounded lime shells. I have tried this animal meal for ten years, and found it to work like a charm. It can be found at most of our feed stores, and the expense is not great, about twice that of corn-meal. The hens will be grateful, if along with their grain some fine cut cabbage or rowen is furnished them.

Eggs command so high a price in the winter, and are such a nutritious and easily digested food at all seasons, that farmers will find it to their advantage to produce a liberal supply for the family table, and a surplus for the market. He will show himself a public

benefactor, who makes his hens lay two eggs, especially in winter, where they formerly have laid but one." Hens should have plenty of sunlight in their pens in winter, consequently poultry-houses should have a southern exposure, and large windows for admitting it. Double

MAKING A CHOICE.

glazing of the windows, or green-house sashes are a great advantage to a poultry-house. It should also be dry, warm, and well ventilated. A coal stove, or an oil stove affords a good means of warming a hen house, and can be managed with very little extra

labor. Give the fowls a hot breakfast every morning in winter. A mash of corn meal and wheat bran, in which a little salt and cayenne pepper is sprinkled is excellent for them in cold weather, and greatly relished by them. Potatoes, turnips, and carrots boiled, mashed, and fed warm are also good for them occasionally.

Save all the scraps from the table, and put them in a little water, and when hot, mix up with wheat bran or corn meal. Give also meat scraps in winter, as these supply in part the place of insect food in summer. Boiled sheep's pluck hung in the hennery just high enough for them to conveniently pick it off, is excellent; scraps from trying establishments are also good for animal food. Fowls should be fed at least twice a day, and many of our most successful poultry breeders feed three times. We would recommend the hot mashes for breakfast, and grain for the other meals, all kinds of grain and green food being given, as recommended in the summer care of fowls. Nice rowen, as previously stated, is greatly relished by hens in winter when they cannot obtain fresh grain. We usually keep a cabbage head hung up by the roots, so that the fowls can eat it whenever they wish, in our poultry-house in winter, and it is surprising what a quantity of such green food they will eat. Warm water should always be given for drink in winter.

Food for Fowls.—Fowls require a greater variety of food than any other of the domestic animals. Animal and green food are essential, although the bulk of the feed may be grain, either whole or ground. Any one having ever had the care of poultry, or an opportunity to observe their habits, must have noticed how quickly they will select the meat scraps first, from a mixture of table scraps thrown to them; also, when permitted to range, how eagerly they scratch and search for grubs, and jump and run after grasshoppers and other insects. They will even follow a cow in the pasture for hours, to catch the insects she stirs up, as she grazes. Flesh or fish, or even both should be given fowls when they cannot have access to insect food, as for instance, in winter, or when confined in summer. Corn, when fed in too large quantities, has a tendency to make hens fat, rather than produce eggs. Buckwheat and oats are better food for egg production than corn, although the latter should be fed in moderate quantities for a variety.

Barley of good quality, and wheat are also excellent for fowls. Corn meal and wheat bran thoroughly cooked and mixed with mashed boiled potatoes, and seasoned with a little salt and cayenne pepper makes a good food for fowls. It should be made stiff, fed when hot, and never in a sloppy condition. A little chopped onions occasionally mixed in, say once a week, is also good. A hot mash made of one-third wheat bran and two-thirds corn meal, and seasoned with salt and pepper is also excellent. Sunflower seeds are a valuable food for fowls, being oily and nutritious. They furnish one of the best egg-producing foods; fowls fatten readily upon them, while they keep them in excellent condition. In summer, hens will eat an astonishing amount of green food, such as grass, weeds, vegetable leaves, potatoes, tomatoes, and other vegetables, when they can have access to it, and this shows that they should have a supply of green food of some kind in winter. Apple and vegetable parings should be thrown to them to pick over, and rowen hay given.

An extensive poultry tender says: "As long as cabbages can be had, three or four heads a week are hung up in our hennery by a string around the roots, to a nail at a convenient distance from the floor, and the fowls eagerly eat all but the roots. Sixty fowls will consume a corn basket of hay every two or three days, in addition to the regular bill of fare. Employment is needful for them, so all the grain is scattered in the straw that they may enjoy the luxury of scratching; and while so occupied, they are not forced to pluck each other's feathers for amusement; for mischief is found for idle bills and well as for idle hands; though we think the constant use of salt has something to do with preventing this bad habit."

We have never tested fowls with ensilage, but we see no reason why it would not

be relished by them, and make an excellent substitute for fresh grass. Hens will also pick up a great quantity of grass and other seeds of plants in summer, such as timothy, meadow fox-tail, etc. Grain serves as a substitute for such seeds in winter, but if the farmer would sweep up his barn floor more frequently, and throw the sweepings into the hennery for the fowls to pick over, they would greatly relish the treat. It is customary with many poultry breeders, when confining fowls to a limited enclosure, to keep alternate yards sown with something green, such as oats or grass, to supply green food for the fowls, they feeding upon one yard while the other was attaining a sufficient growth for them, to which, when ready, they were turned while the yard previously occupied was again sown for another crop of green food. A liberal supply of gravel, pounded shells, etc., as previously recommended, should always be kept by them.

Breeding Fowls.—The first and second year of the hen is the best time for laying, although many hens three or four years old will lay quite well. Hens two years old and over make the best sitters. The tendency of Asiatic fowls is to breed to lighter colors, therefore the males should be as full colored as possible, although discretion and judgment must be used not to have too violent a contrast in the sexes. As a rule, heavily penciled males will get heavily penciled chickens, but if the saddle and neck-hackle are very dark in color, the chicks will be liable to be spotted, but cocks with dark hackles, and hens with lightly penciled hackles will produce rather light penciled chickens. It is commonly supposed that the male bird has most influence upon the color of the chicks, the comb, and many of the fancy points of the breed generally, while the hen influences the form, size, and the useful properties principally.

It is also found with regard to crossing breeds, that the cockerels in the progeny will generally resemble the male parent to a greater or less extent, while the pullets will resemble the hen. In mating birds, the best results are obtained by having both parents as near perfection in form, etc., as possible, but if there are any defects, the defects on one side should, as a rule, be counterbalanced as far as possible by a high degree of excellence on the other, avoiding serious defects. Mr. Wright says: "If it is desired to increase *size*, a cross with a *hen* of foreign breed should be employed, and the same if it be sought to introduce a more prominent breast, or any other peculiarity of shape; but if it is the plumage which is to be modified, it is the *male* bird who should be thrown in. In breeding the cross out again, or in retaining any new characteristic, so as to form a fresh variety, the same rule must be kept in mind.

We believe that much disappointment and uncertainty in the results of crossing has been owing to a neglect or ignorance of this simple principle, and breeding from either sex indifferently. If this be done, the result will often be worthless, and in every case the time consumed will be much greater than is necessary; but if scientifically conducted, we believe crossing would improve many of our older breeds in size, hardihood, and utility, without in any measure detracting from those qualities for which they are valued."

On breeding pullets of the last season's hatch it is better to mate them to adult cocks, and in breeding from hens of a year or two old, young cocks should be chosen; this gives a stronger and more vigorous progeny. Although profitable fowls may be obtained from crossing different breeds, yet we believe it pays better to keep pure breeds of poultry; and in order to keep the breed pure, they must be kept entirely separate from others.

Incubation.—It is thought by many of the most successful poultry breeders, that the best results are obtained when the nests are made upon the ground, or where there is a sufficient quantity of earth under the nests to afford a slight moisture for the eggs. Eggs in such nests are more liable to hatch a larger proportion of chicks, and the chicks thus obtained are more apt to show a more vigorous constitution, than those hatched in a dry nest; besides, vermin is less liable to be troublesome in such cases. When making a nest upon the ground,

a small hollow should be scraped in the earth, and a nest box placed over it, to screen it partially from sight, since whether for laying or sitting, a hen naturally likes her nest to be in a partially darkened place, where it will be screened from observation. Soft hay, or straw, cut into two inch lengths should be spread over, and shaped into a very slight hollow, but care should be taken to fill up the corners of the box, so that the eggs may not roll out of the nest, and get into them. When nests are made in boxes, a few shovels full of damp earth should be put into the bottom of the box before putting in the hay or straw in summer, and dry earth or ashes in winter. A little sulphur sprinkled over the earth before putting in the hay, or kerosene oil turned into the corners of the boxes, will also aid in preventing trouble from vermin, and will do no harm to the eggs. The eggs set should be marked with a pencil, so that if another hen should chance to add to the sitter's original number, as is sometimes the case, such eggs may be readily distinguished from the others.

Miss M. H. Reed, of Amenia, N. Y., in an address before the Connecticut Board of Agriculture, gives her method of setting hens, which contains so many useful suggestions, that we give the following extract from it: "In selecting the eggs, we choose the larger and perfect ones, and gather two or three times a day, and keep in a cool place. We have found that the fresher laid eggs hatch in the greatest proportion, — but have often kept them two weeks, or even three, and had good success, but the chances are greatly in favor of those just laid. When two or three hens are fully determined to sit, unless this should occur too early in the season, the sitting-room is prepared for their exclusive use by shutting out the other fowls, and putting it into a perfectly clean and orderly state — it is emptied, swept, garnished. The floor is sprinkled with clean, dry earth, and covered with straw. The nests are made in movable boxes, with soft hay, and placed on the floor in a close row around three sides of the room.

The feeding trough is placed through the middle of the room, and is always supplied with corn. The drinking trough and the dusting box on the unoccupied side of the room, with a small box of gravel, complete the outfit. In here the hens stay until incubation is over, and sometimes fifteen hens live in peace after a few days' quarreling at first. And this is just where the trouble begins; but with proper care the loss from this source is far less than the gain. In the early part of the season eleven eggs are enough for a sitting, and thirteen later when the weather is warmer. The hens are taken in just after dark, and if they have been properly tamed and trained, they will stay where they are put; and even if they do conclude to exchange nests after a few hours, or a few days, it will do no harm, as there are only enough nests with eggs to go round and so all are kept covered. But sometimes it happens that an old hen will not go on at all unless she can have her choice. We put her gently a few times where we want her, and if she will not obey then, we make the other hen give up her place.

Sometimes a giddy young creature will refuse to sit at all unless she can have her nest where she first selected it outside the sitting room, and we find her at all hours of day and night wandering about the room defying authority or persuasion. Such are soon taught better manners by a few days' cooling in an out-door coop in solitary confinement, with only 'bread (wheat) and water.'

At first the hens need close watching at about noon when they all come off to feed; but they soon learn to go wherever they find an unoccupied nest. If others are added to this flock after the first week, more care is necessary to keep them on their own nests, as a hen knows best how long she can safely leave her nest at the different stages of incubation, and to put a hen that has been sitting two days on eggs that have been covered two weeks or more, would almost insure the death from chill of the chick in the shell. For a few days the hen can remain off a long time, but as the twenty-first day draws near her periods of recreation are much shorter, and a sensible hen will not leave her nest after hearing the first peep.

If an egg is broken in any nest and the remaining ones become soiled, they must be carefully washed in warm water, or the coating of egg will stop the pores of the shell, and smother the chick. The nests are examined daily to see if all is right. One restless hen will often cause much trouble in this way. As the season advances and the weather becomes dry, it is best to sprinkle the eggs and hay towards night slightly with warm water twice, — first about the fourteenth day, and again the eighteenth or nineteenth. This softens the shell and so moistens the atmosphere that the lining will not dry upon the chick before it has time to release itself.

If possible, a room full of hens is set at the same time, as it takes little longer to care for twenty than for five. When the chicks begin to hatch, they are removed from the hen as soon as dry, into a basket lined on the bottom with paper, and are covered closely with a woolen cloth, and set by the fire. We once placed fifty in a corn basket and put it by the kitchen stove, and after an hour's absence returned to find the fire increased and the poor things nearly smothered to death. They are kept in the basket two or three days until their mother, or some other hen, is ready to receive them into the coop. They will begin to eat on the second day, and this early handling does much to make them tractable.

The first foe that confronts us is the large brown louse from the hen, which is properly a tick, and fastens itself firmly to the head of the chick; and sometimes a dozen of these giants can be found on one little pate. There they suck the blood until the poor victim grows weak and thin, and perhaps dies of gapes or any other chicken disease that may prevail.

To prevent this, we used the kerosene in the nest boxes; but lest by chance one should appear, we grease the head of each one before putting it again with the hen with a moisture of equal parts of lard and kerosene. An assistant once, intending to make very thorough work, used so much oil that it ran into the eyes, and caused thirty to die of blindness.

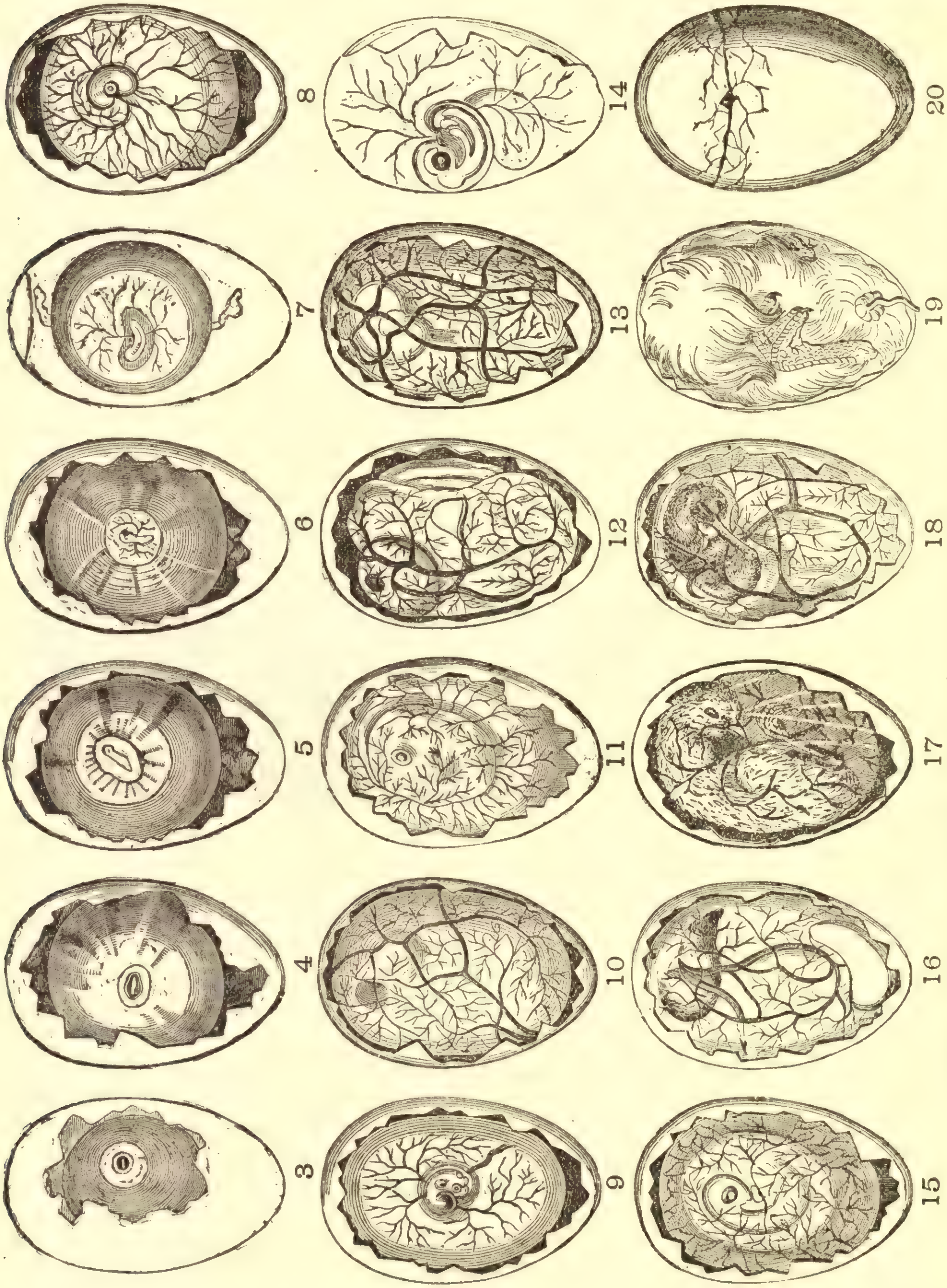
BARREN EGG. FERTILE EGG.

The coops are movable, with board bottoms, and are placed each year in a new spot, in the sun early in the season, and in the shade later. Twelve or fourteen chicks are given to each hen, and for a few days she is confined to her coop, but afterwards allowed liberty in the dry part of the day. She has all the corn she will eat as long as she broods the flock, and so keeps fat and warm, and often begins to lay before she weans her family."

An occasional sprinkle of sulphur or Scotch snuff in the nest while the hen is sitting will be a good preventive against vermin. The nest and eggs must be kept *clean*. After the hen has set about ten days, it will be well to sprinkle the eggs and nest with tepid water three times a week. At the eighth or tenth day of sitting, the fertile eggs can be distinguished from those not fertile by holding them up before a strong light; if fertile, the egg will be dark and opaque; if not fertile, it will be merely transparent, as shown in the accompany ing cut.

Forty-eight hours from the time of the first breaking of the shell commences is sufficient time for the entire brood to hatch. Where the eggs set were all laid about the same time, the hatching will be quite uniform; but when the eggs vary much in age the time of hatching will vary. When small, light hens are set, or when all the eggs were about the same age, we do not approve of removing the chicks as they hatch from the mother, as they are more

contented with her, and they gain strength by the natural heat of her body; but where there is considerable difference in the time of hatching, the hen would be liable to forsake the nest with her little brood before the eggs were all hatched, if the first hatched were not taken



APPEARANCE OF THE INTERIOR OF FOWLS' EGGS DURING INCUBATION—3D TO 20TH DAY.

from her. Heavy hens, like Brahmas and Cochins, would be liable to step on the chicks in the nest and crush them if they remain with her until all are hatched. In all cases, the shells of the eggs hatched should be removed from the nest every few hours during the time of

hatching, as they fill up the nest, and are also liable to slip over the unhatched eggs, and sometimes prevent their hatching. Handle the hen always with the greatest gentleness and care, as she is easily disturbed and annoyed at such times. It is a good plan to set hens just at night; in such cases the eggs, if fresh when set, will generally begin to break at night or in the afternoon. Towards night remove all the broken shells from the nest, give the hen food and water, and darken her place of sitting so that she will not be liable to come off with her little brood in the morning before it can be ascertained whether all the eggs that will, are hatched.

It will be well on setting a hen, to tack a card to each nest, with the date of the time of setting, the number of eggs set, and chicks hatched. These cards, when preserved, will show how many eggs were set, and chicks hatched during the season. The cuts on the previous page represent the internal condition of eggs that have been taken from under hens at different periods, while being incubated—such as have been sat upon from three and four, up to nineteen and twenty days. Or, commencing with the appearance of the *interior* of fertile eggs (in process of incubation) with the third day, and ending with the condition of such eggs upon the twentieth or twenty-first day, when the shell is naturally cracked, prior to the emerging of the living chicken. The first stages of the embryo are thus exhibited, and the several stages toward the successful hatching of the chick delineated, until ready to break its covering, and emerge alive.

Period of Incubation of Various Fowls.—The following table gives the shortest, average, and longest period of time in relation to the incubation of various fowls. Newly

NAME OF BIRD.		PERIOD OF INCUBATION.		
		Shortest Period.	Mean Period.	Longest Period.
Turkey, sitting on the eggs of the	Hen	17	24	28
	Duck	24	27	30
	Turkey	24	28	31
Hen, sitting on the eggs of the	Duck	26	30	34
	Hen	19	21	24
Duck,		28	30	32
Goose,		27	30	33
Guinea Hen,		24	26	30
Partridge,		22	24	27
Pheasant,		23	25	27
Pea Fowl,		26	28	31
Pigeon,		16	18	20

laid eggs will always hatch earlier than stale eggs, while the degree of temperature in the body of the sitter will also make some difference in the period of incubation. Chickens, on the average, will break the shell at the end of the twenty-first day. If proper care has been taken to preserve moisture during the period of incubation no assistance will be needed. To disturb the hen more than to take the chicks out of the nest as fast as they hatch and are dried off, does more harm than good. When the shell has been chipped for some time, with no farther progress made, the chick may be helped a little by gently cracking the shell all around, without tearing the membrane that lies underneath. If that be torn, the fluid will be apt to dry and glue the chick to the shell. We have sometimes assisted chicks from the shell when the membrane has thus become torn and dried on, and had them live; but generally they will be weak and soon die. If blood oozes from the membrane in the operation, there will be but little hope of success.

Sex of Eggs.—Many experiments have been tried, and much written upon determining the sex of the future chick by the appearance of the egg. The theory entertained in the

time as ancient as Horace, was, that long eggs would produce cocks, and those of a rounder form, pullets. Another ancient author, Columella, also advances the same theory. This theory is also entertained by poultry breeders of the present day. Others affirm that the sex can be determined by the position of the air cell in the egg. The exact location of the air cell can usually be determined, by going into a darkened room and holding the egg between the eyes and the light. It will be found in many different positions, sometimes at the end of the egg, near the large end, and at the side, or midway between the end and side. It is thought by many, that if the air cell lies at the end of the egg, a cock will be produced, while if it lies at the side, a pullet will be the result. If an egg is full, or has no air cell whatever, it should not be used for sitting, as such eggs will not hatch. It has been found, by many experiments, that the early eggs of pullets will produce a larger proportion of cocks than pullets.

No rule has yet been determined as strictly reliable, but we are inclined to the opinion that when a large proportion of pullets are desired, the oval, rather than the long eggs should be chosen for setting, and such as have the air cell at or near the side; while if a majority of cocks are preferred, the large eggs having the air cell at the large end should be selected. One poultry breeder says: "Out of the hatchings of three hens, the percentage of pullets from eggs with the spot on the side near the end, was about nine-tenths of the number living."

Another extensive breeder gives the result of his experience as follows: "First sittings, —Eggs taken as they come from the nest; fifty-three chickens, gave twenty-eight cocks and twenty-five pullets. Second trial.—Eggs picked with the air sack more on the side than on the end. Result, thirty-five chicks—twenty-four pullets, eleven cocks. Third trial.—Eggs picked with great care, the position of the air sack marked with a pencil by lamp-light, and none set but those that had the air sack well past the center of the top of the egg. Result, thirty-one chickens—twenty-seven pullets, four cocks. Fourth trial.—Eggs picked with the air sack on the top of the egg. Result, sixteen chickens—fourteen cocks, two pullets. Fifth trial.—Eggs taken as they come from the nest. Result, thirty-eight chickens—seventeen cocks, twenty-one pullets. My breeding stock were White Leghorns. Hens, two years old; cocks, ten months. Another fact I wish to mention. The cocks from the eggs with the sack on the side were all lop-combed, feminine-looking, not one fit to breed from; while the fourteen eggs with the air-sack on the top were all fine, well-shaped birds. In examining the eggs, I find there are nearly one-third where it is impossible to determine the air bubble, being neither on the top or sides, but about half way between. Those I discarded."

Although the above rule may not prove strictly reliable in every case, other conditions having a modifying influence to a certain extent, yet we believe it to be the most reliable that has ever been adopted.

Care of Chickens.—Chickens require no food whatever for twenty-four hours after hatching, as there is sufficient nutriment in the egg to sustain them for a time. When taken from the nest as soon as hatched, they should be put in a warm place in a basket in which is a sufficient supply of cotton, wool, flannel, or other warm, soft material to put under and cover them, until the whole brood is hatched. Care should be used not to cover them too closely, or put them where the heat will be so great as to smother them. Young chickens are very tender, and consequently are sensitive to either too much cold or heat. We have known of large numbers being killed by having the basket containing them thoughtlessly put under or too near a hot stove. Never remove the little horny scale seen at the end of every young chicken's bill, as is the stupid custom with many ignorant persons. Their beaks are very soft and tender, and would be liable to be injured by such harsh treatment.

The first meal should be hard-boiled egg, chopped fine; this should be continued three or four days. Always give the hen all she will eat of wheat, corn, or meal mush; give her

also all the water she will drink. The chickens should have water kept by them, but never be forced to either eat or drink. They will follow their own natural instinct, and eat and drink when they require nourishment, if the food and drink are provided for them. Loppered milk should also be given them. A little meat, cooked and chopped fine, should be given once a day. Insect food is a part of their natural diet, and chickens fed with a little meat will have more constitution and grow and fatten more rapidly than if deprived of it. Sheep's pluck, refuse meat from the butcher, such as the lights of beef, make excellent food when boiled tender and chopped. Rough tallow, chopped fine, and drippings from meat are also good to mix with scalded corn meal as the chicks get older. Skimmed milk is better than water to mix with the corn meal. Cracked corn, or wheat screenings, scalded, come next in order, and may be given when the chickens are old enough to digest it. A pailful of corn or wheat should be covered with boiling water in which a large tablespoonful of salt has been dissolved and left to stand covered until it is cold. Cayenne pepper should be added if the weather is cold or wet. Rice is also an excellent diet for chickens. An inferior quality known to the trade as "broken rice" is just as good for this purpose, and it requires so little for food that the expense is not much greater in the Northern States than corn-meal, while at the South it will be the cheapest feed known.

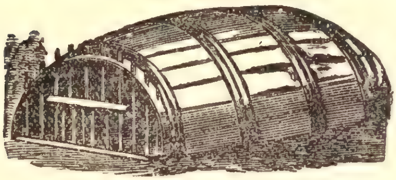


FIG. 1. BARREL COOP.

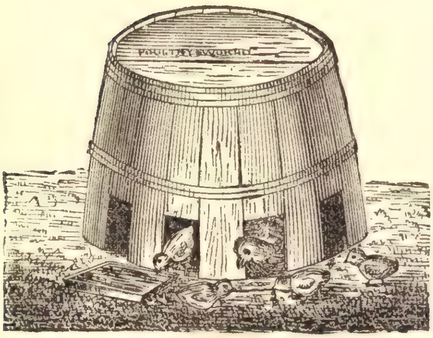


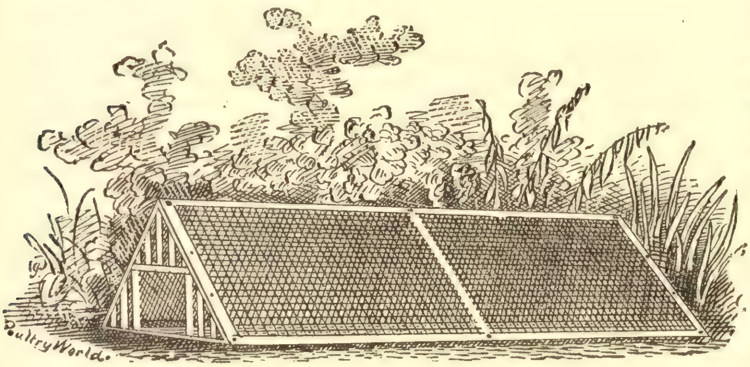
FIG. 2. BARREL COOP.

FIG. 3. BARREL COOP.

It should be cooked or soaked before feeding. During the first week, every two hours during the day will not be too often to feed chickens. Feed them all they will eat at each time, but do not leave any to become sour, or to be mixed with dirt and afterwards eaten. Chickens will never thrive unless they have a supply of clean, fresh food. From one to two months old, once in three hours, is none too often to feed; after that, three or four times a day is sufficient.

Chickens should also have green food. If there is no grass plot for them to run upon, give them cabbage or lettuce leaves cut in fine shreds. When the hen has hatched her brood, and is ready to be taken from the nest, she should be placed in a coop where it will have a southern exposure, so that the chickens can have the benefit of the sunlight. Never permit them to be exposed to the wet and cold. Coops of almost every pattern may be designed,

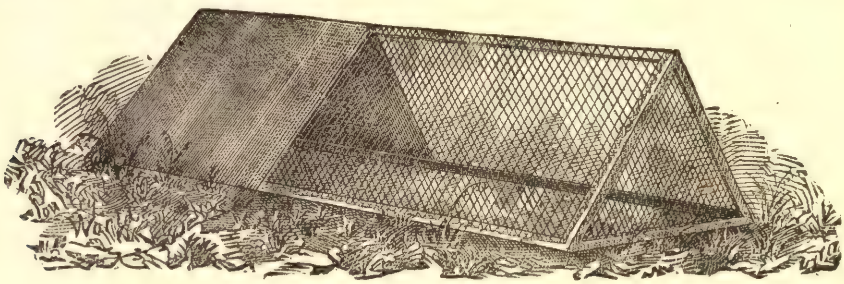
according to the ingenuity of the maker. A coop with a covered wire run that may be moved at pleasure is very convenient for protecting young chickens when cats and rats are troublesome. Such coops afford a complete protection for the chickens, while they can be moved to fresh ground as often as desired. A very good temporary coop can be made from an old barrel, by knocking out one end and putting slats in front. An opening should be made at the other end sufficiently large for ventilating purposes, and where it will be near the top of the coop when ready for use. Very good coops may be made from barrels, as represented by the Figures, 1, 2, and 3.



COVERED RUN FOR CHICKENS.

In order to prevent the old fowls and half-grown chickens from eating the choice bits of food from the little ones, some kind of coop should be devised into which the latter alone can enter. Large box coops with slated tops of lath, raised upon blocks of a sufficient height to allow the little ones to run under and exclude the larger ones, are good for this purpose. The food should always be put upon a clean surface, and never upon the sand or soil.

Incubators. — Hatching eggs by artificial means was practiced by the Egyptians and Chinese successfully thousands of years ago, and is also at present; yet, in Europe and this country the practice is comparatively a recent one, and is not as well understood as it probably will be in the future, although very good results have been obtained at the present stage of experimenting, those having attained the highest success that have followed nature most closely.

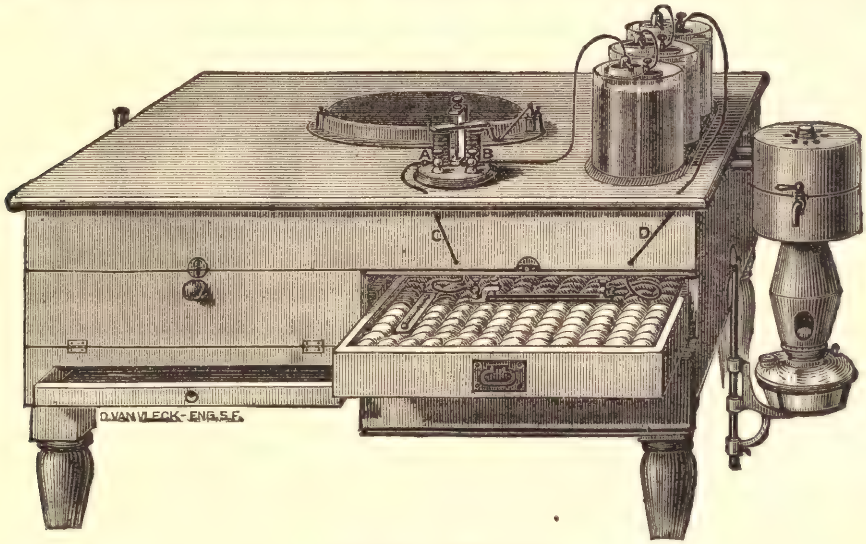


COOP WITH COVERED RUN.

Reaumer was the first who attempted in a systematic and earnest manner to hatch chickens by heat artificially applied. His method was to place the eggs in a wooden cask, and then surround it with fresh manure from the barn yard in a state of fermentation, which was renewed as frequently as necessary to keep the proper degree of temperature. This method, undesirable as it is, was employed for a considerable time, and quite successfully in France. Cantelo was the first who devised the method of supplying the heat from above, in imitation of the hen. Various kinds of incubators have since been invented, some of which were attended with so much care and labor in management, that although they would hatch a large proportion of the eggs, their use could not be regarded as profitable. Within a few

years past considerable improvement has been made in incubators, until we have them now that are so simple in construction, that they can be successfully managed with comparatively little labor and expense.

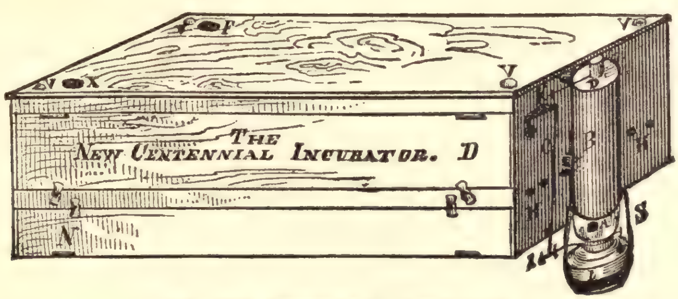
An incubator that will hatch from seventy to seventy-five per cent. of the eggs, may be considered a good one. As with the hen, the fresher the eggs, the better they will hatch. Eggs that are over a week old, will, as a general rule, hatch very poorly by artificial heat.



ECLIPSE INCUBATOR.

With the hen, there is considerable loss by eggs broken in the nest, and nests deserted from one cause or another. Again, the eggs of different breeds of poultry vary greatly in fertility, while the eggs of the same breeds will also vary much in this respect.

In the Eclipse Incubator, manufactured by E. A. Samuels, of Waltham, Mass., the heat is radiated from a tank which is so contrived that there is a uniform circulation of hot water through it, and is applied to the *top* of the eggs in imitation of heat from the hen. The eggs are placed in drawers, the bottom of which consist of wire netting. Beneath the drawers is a series of ventilating pipes, which conduct to the bottom of the eggs a full supply of cool, damp air. The water in the tank is heated by a kerosene oil lamp, which consumes only about a quart of oil in twenty-four hours. The lamp burns beneath a small boiler which connects with the tank, as illustrated in the above cut. By no possibility can the fumes of the lamp enter the incubator or reach the eggs.

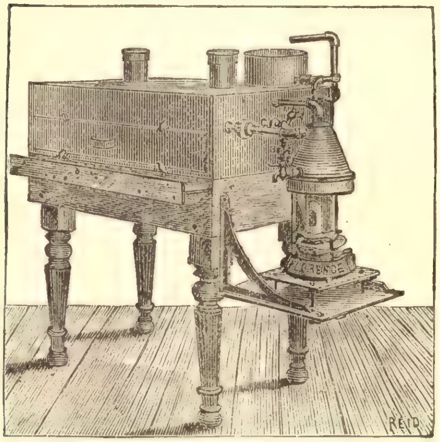


THE NEW CENTENNIAL INCUBATOR.

B. Boiler. C. Connecting Rod. D. Door of Egg Chamber. X. Tube through which Tank is filled. H. Ventilator to Nursery. I. Lamp Lever. K. Outside Lever of Rock Shaft. L. Lamp. N. Door of Nursery. S. Springs which hold lamp in place. V. Ventilator flues from Egg Chamber.

The New Centennial Incubator, manufactured by A. M. Halsted of Rye, N. Y., is in two parts; an inner case of galvanized sheet iron, covered by an outer casing of wood; with a dead air space between the two cases. It has double doors — an inner and outer one — the inner one being provided with a glass window through which to examine the thermometer and the eggs. There is no electricity, no clock-work, no weights, pulleys, or double levers. A simple rock-shaft passes through the side of the machine, with a lever on each end of the shaft; one of which is connected with the regulator, and the other with the lamp. A simple thumb-screw in the back of the machine, on the outside, adjusts the regulator to any required degree of heat.

The regulator is placed above the eggs, out of the reach of the young chicks. It is sensitive to the least change of heat, and very powerful; and instead of changing the flame from one extreme to the other — either very high or very low — as is the case in all other machines, it regulates the lamp to give the required heat. The action is regular and graduated to the needs of the machine: if in a very warm room, a low flame is produced: if the room grows colder the flame increases; and if the temperature of the room continues to fall, the flame grows larger until the full power of the lamp is turned on.



RELIANCE INCUBATOR.

Ventilation is provided for, by taking in a current of pure air, which passing close to the tank, is heated before it comes in contact with the eggs. It is then drawn to the four corners of the egg chamber, and thence carried by tubes outside of the machine. By this device the sides of the egg chamber receive the same amount of heat as the centre, and there are no cold corners. The moisture or evaporating pan is so placed that it receives a gentle heat from the return flue, and thus supplies a moderate amount of vapor constantly under the eggs.

In the Reliance Incubator, by James Dennis, East Providence, Rhode Island, a soapstone radiator, which is heated by hot water pipes imbedded in it, is used for heating instead a hot water tank.

There are several incubators of greater or less merit now in use in this country. Mons. Boucheraux, a French writer who has experimented quite extensively in hatching chickens by artificial means, gives the results of his investigations, which have been translated from the *Monthly Bulletin*, a French journal of the Society of Acclimation, as follows: "Having tried several kinds of artificial hatchers, I have quite frequently noticed that many of the young die in the shell at the end of the sixteenth, seventeenth, and eighteenth days, and that the greater part of those that survive until the twenty-first day, would die at the time of hatching. Perhaps, they were not sufficiently strong, or it may have been that the pellicle which envelopes them became so dry that it was impossible for the young chick to come out of his prison. In order to furnish more moisture I made, some two or three years since, a new artificial sitter, the hot water receptacle of which is made of *terra cotta* enameled on the inside; this allows a sufficient quantity of moisture to transpire on account of its porosity. I have, with this arrangement, obtained much better results. The hatching gave a much larger per cent., and I observed that the pellicle, of which I spoke just now, was exactly similar to that of eggs hatched under the hen. But in spite of the success obtained by this method, I have not as yet found a wonder. for I find it impossible to preserve for more than ten or twelve days the chicks hatched in this manner. One of my friends, whom I had make an autopsy for me, found

that they all had diseased lungs, and were afflicted in the same manner as those which have several times been submitted to the experience of the pneumatic machine. I therefore concluded that there was a failure of air; indeed my incubator was so air-tight that there was no loss of heat, and even my opening the door twice a day did not suffice. At last, after groping first here and then there, I constructed an incubator which, I believe, unites all the required conditions.

This incubator consists of a rectangular wooden case about forty inches in length, twenty inches high, and about thirty inches wide. This fits upon a wooden bottom, supported by two hooks, to enable it to be readily taken apart for cleansing purposes. In this case a reservoir of zinc is placed horizontally (the capacity of this reservoir being about eighteen gallons), which divides the case into two compartments. This reservoir is filled and emptied by a system analogous to that of other incubators. The water in the reservoir is kept at a constant temperature by two gas burners, which enter into the boilers and traverse the reservoir from side to side. A collecting pipe distributes the gas in the burners, and is provided with a mercurial regulator placed on the inside. This regulator is nothing more than a strong thermometer with a hole in its side, through which the gas passes to its destination. This hole is opposite the 102° mark.

The opening giving passage to the gas finds itself entirely stopped when the temperature reaches the desired height. The mercury forms an obturator, and regulates the heat to one-tenth of a degree, nearly. It is indeed completely impossible, without regulating anew this thermometer, to raise the heat beyond the necessary point. With this regulator there is no pressure nor change of heat in the gas. In the absence of gas two small lamps with a flame capable of being regulated; a hole is made in these burners and the products of combustion escape by means of two openings behind the apparatus. In order to give the eggs the amount of moisture necessary for incubation, there are two small holes with funnels soldered around them, and with movable plugs, which permit the steam from the water in the reservoir to spread itself in the egg chamber and keep there an atmosphere always moist. Over the reservoir are two air tubes pierced with small holes (.035 inch in diameter), the one coming in at the right side and going over to the left; and the other coming in on the left, and going over the right side, carrying the fresh air over the eggs and removing the carbonic acid gas.

The air, in thus entering, becomes warm in its whole course over the reservoir, and does not chill the eggs. The air is thus in the same condition as that which has passed through the feathers of the natural mother. About two inches above these tubes we find a screen coming to about an inch from the side of the case (the same space being left in the middle). This screen is composed of three layers, the bottom one of zinc, then one of wood, and the third of swan down, with a little cut straw thrown over this top layer. The eggs are placed upon this bed, and the zinc below, being highly polished, permits the heat to glide along the surface and pass through by the opening in the middle of the screen, and those between the screen and sides of the case to become stored up in the chambers. The heat is stopped above by two glass plates with a stratum of air between them, and redescends upon the eggs, causing the last ones to be heated from above, although they are placed over the reservoir.

I have thus been able to leave chickens in the hatching chamber for twenty-four hours after hatching, without any injury whatever, after their successful *entrée* into the world. The chamber below, being furnished with air in the same manner as the one above, serves as an artificial mother. A small door made in front gives the liberty of ingress and egress to a rearing door; a door placed behind permits one to have an eye upon them. This incubator being closed above by two superimposed panes of glass, renders the different phases of hatching visible to everyone. To sum up the advantages, we find:

1. It is absolutely impossible to give the eggs more heat than is necessary for them.

2. A regulator permitting you to modify this heat in proportion as the embryo increases its vitality.

3. Moisture necessary for incubation and much or little as desired at the time of hatching.

4. Constant and natural supply of pure air, to promote general good health. Indeed, most all of the inconveniences of artificial incubation are avoided by this apparatus.

Having once placed the incubator in a position well sheltered from atmospheric changes, firmly fixed and on a level, take care to have it filled with warm water. Should the incubator have a gas attachment it will be necessary to allow this to pass through the regulator, and to open the other cock only when an accident or the absence of the gas has occasioned too much cooling, and never to leave this cock open without observing scrupulously the temperature inside the incubator, for it would be very easy to bring mortification to the operator. If the incubator has a lamp attachment, it is necessary to note well that this is only for the purpose of preventing the water from cooling too quickly, and that the 102° to 104° should be attained only by the addition of boiling water. One or two days should suffice to regulate this apparatus.

Before placing the eggs on the frames these latter should be covered with a thin layer of wool in such a manner that the heat does not come altogether on the under side. The glass cover of the incubator should also be covered with a bit of cloth or linen to darken the interior. The thermometer should be placed upon the eggs. The gutty eggs should be taken out of the incubator, as well as those marked with grayish blue spots, by which the air comes too quickly to the interior.

The eggs should be turned morning and evening without shaking; in fact, they must be handled very delicately. Those on the side should be placed in the center, or in some place other than that they previously occupied, so that during incubation they will occupy all the parts, more or less warm, of the apparatus. It is also a very good plan to procure a small greasy feather from the breast of a Cochin China, if possible, and with this to touch lightly the surface of the eggs before returning them. This procedure will procure for them a small quantity of that grease which gives to them the brilliancy which they obtain during incubation under the hen, and which softens the shell so nicely.

It is necessary to always take care to replace the warm water and obtain the proper degree before returning the eggs. If you do not wish to be exposed to the chagrin of a failure, it is prudent to open the doors only in the morning and evening, when the eggs are being turned.

On the twentieth day it is necessary to be very careful in turning the eggs when they are propped upon the side. The chicken at this time having made an evolution in such a manner as to bring his head to the air, we expose him in this case to the necessity of again making another turn, to the labor of which they most always succumb. It is a matter of great importance to diffuse as much moisture as possible in the incubator, either by placing small jars of water in the incubator, or by sprinkling it upon the wool. This water should be lukewarm, not cold. It is also necessary to take care not to put the eggs in warm water to see if the young chicks stir, for these eggs, not having the shell greased as those covered by the hen, will absorb too much water and the chick will surely die.

Incubation by means of the artificial incubator should be conducted for twenty-one days at a temperature of 102° to 104°. This heat should be maintained for ten out of twelve hours, if we wish to have much success. If it should descend to 50° or 54° at the time of turning the eggs, there will be no inconvenience, provided it returns within twenty minutes to 86° or 95°, and a few minutes afterwards to 102° or 104°, remaining at this temperature for at least ten hours, as above stated. This is why we should not open the doors between the regular times for turning, except in case of accident. If, owing to some outside influence, change of temperature or other, the heat of the incubator should rise to 109½°, we need not disturb ourselves, provided it lasts no longer than two or three hours. In this case

we should open everything and turn the eggs, although they had been previously turned that morning. Likewise, if by one cause or another, perhaps forgetfulness, the incubator has been left without heat and the eggs become completely cold, there is no occasion to be at all uneasy. The eggs can remain in this state for thirty-six and even forty hours with only this inconvenience, that the period of incubation will be prolonged just as many hours as it has been interrupted.

We should not assist a chicken to come out of the shell when even this operation has lasted for ten or twelve hours. The efforts that it makes are necessary for the absorption of the yolk and the umbilical cord. When the chicks are hatched, they should remain ten or twelve hours in the incubator, and that without eating. At the end of this time they should be placed in the compartment below, having previously covered the floor of it with bran or an old bit of carpet.

Proper Temperature for Incubators.—The degree of heat necessary for hatching eggs by artificial means is from 102 to 104 degrees. Reaumer, Vallee, Wortley, Schroeder, Brinley, Wren, Boyle, and other French and English incubator inventors, advise that the heat should be less at the beginning of the incubating process than at the more advanced stage; hence, at the commencement it should be about 102°, and gradually increased to 104°, as the incubation progressed. Mr. Wren states that in his experiments in determining the proper degree of temperature, he placed four eggs in the incubator and submitted them to a heat of 102° at first, increasing to 104° at the last. The result was that three out of the four eggs hatched and did well; while of another batch of eggs where the temperature was reduced, they failed altogether, none of the chicks having properly absorbed the yolk for want of sufficient heat.

He also says: "In this I feel sure we are imitating Nature, because a hen, when she first commences to sit, has feathers between her body and the eggs, which are non-conductors of heat. By the friction of the eggs these wear off, and her body comes in direct contact with the eggs; therefore the heat must, if any difference, be rather greater at the latter part of the time."

Turning the Eggs.—In proof of the necessity of the occasional turning of the eggs during the incubating process, the same author says: "I have examined the eggs under a *sitting hen*, and made the following memoranda of the position of the eggs during a part of one day. At 10.30 A. M. marked four eggs, and left them in the center of the nest; at 1.30 P. M. three of the marked eggs were moved to the outside. Marked three more, and left them in the middle; at 2.45 P. M. the three marked last were moved to the outside. Marked four more and left them in the middle; at 4 P. M. the four marked last were on the outside, and some of those marked first were back again in the middle of the nest."

Mr. A. M. Halsted, of Rye, New York, says on this point: "I have several times carried eggs through the whole three weeks in the incubator, without turning or moving them at all. Unless some accident interfered, there were some which hatched—generally about thirty per cent.; others which pipped the shell, but had not strength enough to get out; and still others, dead, with the yolk sack not fully absorbed, and dried fast to the bottom of the shell; of those which did hatch, most were weakly, and fully one-half died before they were a week old. One lot which I turned twice a week did ten or fifteen per cent. better. Another, which was turned daily, hatched seventy per cent.; and a final test when I turned the eggs *twice* daily, I obtained fifty-eight strong, healthy chickens out of sixty fertile eggs, and both the remaining eggs had fully developed chickens in them.

Hence, I adopted the practice of turning twice daily,—morning and night. Further experiment—turning them three and four times a day, have not given any better results than this."

Management of Incubators.—The following directions for the practical management of incubators are given by Mr. Halsted, to whom previous reference has been made: "Comparatively few are successful in the use of incubators, and many really good machines have been thrown aside and pronounced worthless, when all the trouble has been want of management. First of all it is necessary to thoroughly *test* the incubator. Do not fill the boiler and tank too full; allow for the expansion of the water under heat, remembering that it increases nearly a ninth part in bulk from 32° to 212° Fahr. Test the working of the regulator and ventilators; increase the heat up to 130°, if a new machine, and then decrease it to 100°. Again increase to 103° (the proper heat), and strive to keep it at that temperature. The *range* is from 100° to 105°, neither above nor below these points except perhaps transiently. So soon as you have accomplished this result, you may put your eggs in, not before. The eggs, to insure success, *must be* fresh, not over *three* days old.

A LIFE BOAT.

During the first forty-eight hours, I take the eggs out and cool them for five to ten minutes at least six times, and every six hours is better. If a gentle moisture is maintained in the egg drawer they will need no other application, but if a dry heat, it will be well to sprinkle them with tepid water when airing. The eggs should also be turned as often as twice in twenty-four hours, and oftener would be better. Do *not* during the first six days allow the heat to get *above* 103°. I would far prefer to run it at 102 than risk any chance of its exceeding the former point. During the second forty-eight hours decrease the periods of airing, but increase the time to fifteen minutes. The eggs are supposed to be aired in a room where the temperature is not *under* 55°. During the third forty-eight hours, air twice a day and turn the eggs at each airing. When turning the eggs it is better to change their position also, shifting those in the middle of the drawer to the outer edge. Do not be afraid of handling the eggs. So long as they are not shaken or jarred, there is no danger of their being injured.

At the end of this period (six days), examine the eggs by candle or lamp light.

Partially close the left hand, letting the thumb and forefinger lap; hold the egg between the thumb and two first fingers of the right, *under* the fingers of the left, and turn slowly between the eyes and the light. If it is perfectly clear, lay it aside; it is not fertile; and will not hatch. Fertile eggs will show a dark spot on one side, appearing greater or less as turned on either side of the line of vision. At this stage the progress of incubation varies very much, some eggs appearing half opaque and others with only a discernible spot. The novice must expect to sacrifice some eggs in acquiring this knack, and to that end it were better to put in twenty or twenty-five eggs expressly for experimenting upon.

This is the most precarious time during the whole process of incubation—the fifth, sixth, and seventh days. At this stage a heat of 106° will sometimes spoil a whole batch of eggs; while on the seventeenth day I have *held the heat at* 115° *for over two hours*, and yet hatched out seventeen chickens from twenty eggs. All fluctuation must be avoided if possible; the heat should be steady at 102° to 103°; the eggs aired twice a day, from fifteen to twenty minutes each time; and a slight but perceptible moisture maintained in the drawer. A *dry* heat is much more difficult to regulate, and much more dangerous to the life of the unhatched chick.

After the seventh day a little more latitude may be allowed in the temperature without fatal results, but I would not be understood as *advising* it until after the tenth day, at which time the heat should be slightly increased, say to 102° to 103½°. From this time forth air the eggs once a day, leaving them exposed from twenty minutes to half an hour. During this period the moisture may be kept up, and if anything slightly increased; the object being now to keep the little prisoner in a healthy growing state, which cannot be done *without* moisture. Very many persons fail at the eleventh hour—the eighteenth or nineteenth day —from this cause. I will mention one case in illustration:—A gentleman living some eight miles from me, after seeing my incubator, constructed one himself from ideas of his own. It was made to hatch chickens on a large scale, holding about 1,000 eggs. He started with 500 eggs, and everything progressed finely until about the sixteenth day; at that time he called on me and stated how he was getting along, saying that he thought my practice of keeping a constant moisture *under* the eggs was a fallacy.

He had commenced with it, but after the first week had given it up as too much trouble. I cautioned him about the result, but he expressed so much confidence, said he had broken several eggs that morning, and all contained live chicks, that I concluded there was perhaps a show for success, and so told him. But on the twenty-second day he visited me again: he had not hatched a single chicken; all were dead in the shell, and all seemed to be full formed. A few of the eggs were pipped, but the outer skin was as dry and tough as a piece of parchment, and the poor chick was as hopelessly immured as if it had been enclosed in sheet iron. He was positive that the heat had not exceeded 104° nor been less than 100°; so the failure was attributed to no other cause (apparently) than lack of moisture. I can cite a number of just such instances which have come to my notice, and in all of them the failure was due to the same cause.

One of the most essential requisites for success is *cleanliness.* One bad egg in the drawer will sometimes spoil every one in its vicinity during the second week of incubation; after that there is not so much danger. It will frequently happen that eggs will upon first examination be passed as fertile and yet prove bad. After the tenth or twelfth day examine the eggs closely every day, and if any exudation in the shape of drops of fluid or gummy matter be discovered on the eggs, removed the affected one at once. To show the variation of temperature the eggs will bear during the third week, I will give my experience at the fair of the American Institute, held at Empire Rink, New York City, in September and October, 1870. The place assigned me was on the north side of a room some 300 to 500 feet in size, and within about twenty feet of the receiving door. It was a great risk to attempt to hatch chickens in such an exposed place, but I accomplished it.

Night after night the heat would fall to 95°, and in one instance it went to 89°. It was impossible to keep the heat up, although the incubator was covered and completely enclosed with heavy woolen blankets. Only four times did the heat get to 104°, usually reaching 102° by sixr or seven P.M., and then falling to 96° or lower during the night. The incubator was left at ten P.M., and not visited again until seven A.M. (This would be always my custom with any good self-regulating machine.) The eggs in this case were kept in my incubator at home until the twelfth day, and then taken to New York to the fair, a distance of twenty-five miles by rail. I averaged about *fifty per cent.* in hatching on that occasion, and taking into consideration the constant fluctuation of temperature, this was unusually good success. For moving the eggs from one incubator to the other, I constructed a box, lining it with felt, and placing in the bottom a tank of hot water; then placing the eggs between several thicknesses of woolen blankets and closing the box tight. In one case, where a few eggs had been overlooked and left in the home machine until the twentieth day, I started from home with two of the eggs pipped; on my arrival at the rink, I found one of the chicks out and entirely free from the shell.

I have been led by slow degrees to adopt the opinion that the great drawback to artificial incubation was the difficulty in getting through the first ten days. I noticed some years since that when a hen left her nest, and the eggs were fairly chilled, during the *early* stages of incubation, she rarely brought out any chicks, and usually those that did come forth were weakly, and pined away a few days or weeks of existence, and then dropped off; also, that even when eggs had been left for fully twenty-four hours during the latter days, they often hatched out well and strong. In support of this view, one of my neighbors, a perfectly reliable gentleman, gave me a remarkable instance. He had a large number of turkey eggs set under common hens; under one of the hens were some of her own kind, probably laid to her by one of the fowls roaming over the place (they not being confined in a sitting-room). These hen's eggs hatched, and the mother left the nest with two chicks, leaving ten turkey eggs about twenty-three or twenty-four days incubated.

When found the eggs were cold and supposed spoiled; no further notice was therefore taken of them until two or three days after, when a hen was found to have taken possession of the nest and assumed the duties of incubation. Some days after, to the surprise of all, she came off with seven turkey chicks, all strong and well. This was in June, warm weather. Since then I have experimented with eggs, and have demonstrated to my own satisfaction that eggs can be, at certain stages of incubation, deprived of heat for twenty-four to *seventy-two hours*, and yet be hatched! In fowls this period would seem to be between the sixteenth and seventeenth days; in turkeys, the twenty-first to twenty-third days, perhaps even later. The exact time I have been as yet unable to determine.

My experience with this led me to try placing the eggs under hens during the first few days of incubation. I have found even three days under hens before placing in the incubator a great benefit, but seven to ten days is much better, and one reason I believe to be the following:—If my reader will notice an egg after having been under the hen for a few days, he will observe it to have a *polished* appearance, as if *oiled* and *rubbed.* There seems to be some oily secretion on the feathers or on the body of the hen, which, with her action in moving the eggs, produces this appearance. Eggs thus treated seem to retain the moisture or watery portion of the contents much longer than perfectly fresh ones; hence it would seem that the 'greased appearance' prevented or rather retarded evaporation. An egg placed at first in the incubator and left there the same length has not this appearance, being as fresh to all outward seeming as if just laid. To establish this fact of evaporation, I took eggs of equal weight and placed some under hens and the rest in the incubator, subjecting the latter to a dry heat. At the end of three days there was a discernible difference, and at seven days a very marked difference in weight; at ten days there was *over half an ounce* difference in

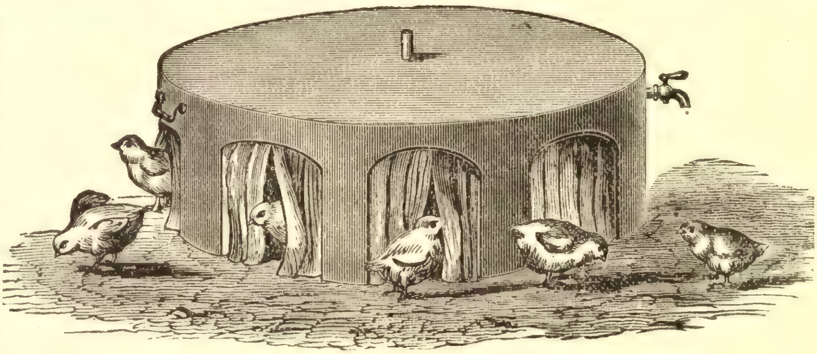
their respective weights. It is in consequence of these discoveries that I so strongly recommend the constant application of moisture during artificial incubation; and knowing how easy it is for a novice to overdo or come short in the matter, I recommend the use of hens for the first seven to ten days.

It would be very easy to give a page or more of directions 'how to manage an incubator,' but all the written directions in the world will not give some men success. Nothing but experience, and that bought with many failures, will teach them the *little* attentions necessary to ensure success. I have striven to give these plainly, and if any of my readers are benefited by it my labor will not be lost. I add a table of record of daily temperature and remarks as jotted down by me during a few weeks of successful operation."

REGISTER OF INCUBATOR.

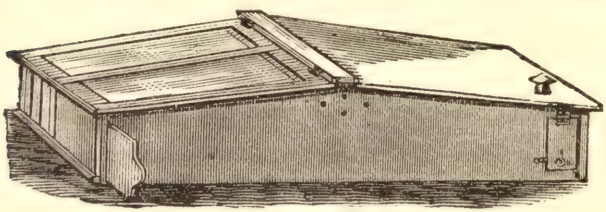
Date.	MERCURY.					REMARKS.
	6 A.M.	12 N.	6 P.M.	10 P.M.	Open Air, 6 A.M.	
1869.						
April 13	—	—	—	—	—	Started heat in incubator at 1 P.M. At 10 P.M. mercury marked 115°. Turned down lamp.
" 14	98°	104°	102°	100°	38°	
" 15	97	101	102	104	40	Small leak under tank. Put in half an ounce of Indian meal.
" 16	100	101	104	102	37	Leak stopped. Lamp burning evenly. Trimmed twice.
" 17	101	103	103	102	40	Put in twenty eggs.
" 18	101	102	103	103	42	
" 19	102	102	103	102	38	Raw cold day. Wind east. Turned eggs three times.
" 20	101	102	102	101	41	Filled lamp. Trimmed twice daily. Turned eggs three times.
" 21	100	102	102	102	43	
" 22	101	101	101	102	42	Put in twenty-two eggs.
" 23	102	103	103	102	45	Examined first lot of eggs; found five unfertile.
" 24	100	102	103	102	44	Turned first eggs only twice daily.
" 25	101	102	102	102	51	Replenished water in egg-drawer.
" 26	102	102	103	103	48	Put in twenty-six eggs. Refilled lamp.
" 27	100	101	102	102	42	Changed blanket under eggs.
" 28	101	102	103	103	48	Examined second lot of eggs. Three unfertile. Turned two.
" 29	100	102	102	102	40	
" 30	101	103	103	103	46	Found one bad egg in remainder of first lot.
May 1	102	103	102	103	50	Put in fifteen more eggs.
" 2	103	103	103	104	55	Examined third lot of eggs. Four bad. Changed blanket under eggs. Refilled lamp.
" 3	102	—	—	102	51	Absent from home. Examined third lot in evening. Four bad.
" 4	102	103	103	103	48	Replenished water in egg-drawer.
" 5	102	103	103	102	47	Put in thirty more eggs.
" 6	101	102	103	103	52	Changed blanket.
" 7	102	102	103	102	51	Two eggs pipped at 12 noon. Both out at 6 P.M. Three more pipped.
" 8	102	103	103	103	54	Thirteen chicks from first lot, and one dead in shell. Refilled lamp. Examined fourth lot of eggs. One bad.
" 9	101	102	102	103	52	
" 10	102	103	103	102	50	Examined fifth lot of eggs. Three bad.
" 11	102	103	103	103	55	10 P.M. three eggs pipped.
" 12	101	102	103	104	51	6 A.M. five chicks out, eight more pipped, and all out during day.
" 13	102	103	103	103	57	Four more chicks out, seventeen in all. Two eggs bad. Put in twenty more eggs.
" 14	102	103	104	103	60	Refilled lamp. Changed blanket.
" 15	101	103	102	101	57	Bad egg broke in drawer. Took everything out, changed blanket and water, washing eggs in tepid water.
" 16	101	—	—	104	—	Absent from home. No record of out-door temperature. Found six chicks out, and several eggs pipped at 10 P.M.
" 17	102	103	104	103	60	Eighteen chicks out. Two partly out, which I helped. One egg pipped, but dead. One egg bad.

Rearing Chickens Artificially.—In order to rear chickens without hens successfully, and with profit, several conditions are essential. There should be provided a suitable warm house, with a southern exposure, and some kind of a warm house or brooder always available. In severe weather it will be necessary to keep the chickens confined within doors, but in favorable weather they should be permitted to run in an out-door pen. Nothing induces disease sooner, or makes chickens more puny and weak, than constant confinement in a warm house. They should be permitted to run out when the weather will admit, but should always have an artificial mother to nestle under when they wish. This may be made in various ways. A very good one may be made by tacking a piece of sheep skin, dressed with the long wool on, upon a barrel, the board to slope from four inches above the ground to two inches, so as to admit of different sized chickens to brood under. The sheep skin should be tacked only around the edges of the barrel, so as to fall a little loose and rest with its weight upon the chickens. A few small gimlet holes should be bored in the cover, and the skin perforated in places to admit of ventilation. This cover is boarded on three sides, the front being left open, except being finished with a flannel curtain, reaching the ground, which keeps out the cold air, and under which the chicks may run with the greatest ease.



ECLIPSE ARTIFICIAL MOTHER.

The Centennial Brooder is adapted to both winter and summer use, and can be used in the open air or under cover. It is well ventilated, keeps the chicks dry in the severest storms, and is a perfect protection against rats or other vermin.



CENTENNIAL BROODER.

A poultry breeder in Wisconsin gives his method of making an artificial mother, as follows: "The mother I use is made of a piece of coffee sack, tacked tightly over a frame, on the opposite side of which is tacked a piece of coarse wire netting. The sacking is then "drawn" with pieces of soft woolen or flannel cloth torn in strips, the ends being clipped off evenly at the bottom and allowed to hang down about three inches. There should be a little platform about $1\frac{1}{2}$ inches high, made a little larger than the "mother," and covered with road dust, on which the chicks nestle to raise them up sufficiently for the carbonic acid gas (which is heavier than air and settles to the bottom of the brooder) to drain off as it were. Next I have the tinsmith make a zinc pan just the size of the "mother" frame, and $2\frac{1}{2}$ inches deep. Then four heated bricks placed on the wire netting, and closely covered with the zinc pan, furnish sufficient and safe heat. At night the birds will retain their warmth until the apparatus is thoroughly heated, and then the natural heat of their little bodies is amply sufficient until morning.

During cold and cloudy days, and always until the chicks are a week old, the bricks should be changed four or five times daily. This is no more trouble than to fill, trim, and watch a lamp, and fill the tank, and is very much cheaper, while you need not fear either fire or suffocation from over-heat. The brooder must be amply ventilated at the *bottom*, *not* the top. This brooder I place in a little rough shed, the east and south sides of which are made of hot house sash, and the floor (of rough boards) covered with road dust, and the arrangement is complete.

The Eclipse Artificial Mother is circular in form; the heat, which is applied above the chickens, comes from hot water which is contained in a covered tank inside the hover. This tank is surrounded on the top and sides by an inch of thick felting, and the whole is covered with a galvanized iron casing. The loss of heat is so small that the water will keep warm twelve hours; so that the hover needs emptying and filling at morning and night only, a gallon or two of water sufficing to fill it. Beneath the tank hangs a fleecy blanket, against which the chickens press their backs just as they do against the hen. The water is supplied at the top through an inch pipe, and is withdrawn through the faucet on the side.

If a large house is to be built, and a considerable number of chickens are to be reared, it will be more convenient and economical to have a boiler introduced, together with a number of pipes, than to have a number of single houses. Mr. E. A. Samuels says: "It is not best to place the chickens that are just hatched under the hovers. but to wait until they are twenty-four hours old. My own practice is to remove the chickens from the incubator as fast as they 'dry off,' that is, after they have been hatched two or three hours, and place them in a wide circular basket, the sides of which are lined with fur or sheepskin. From the top, hanging down into the basket so as to nearly touch the bottom, is a fur or sheepskin cover, and the bottom of the basket is covered with an old piece of carpet. The chickens huddle together in the middle of the basket, and the fur covering rests upon their backs. The basket should be set in a warm place near the stove.

There are a few openings provided around the fur cover, so as to admit fresh air, or the chickens would smother. In this basket the chickens remain until they are strong enough to stand up, and they are then, at night, transferred to the hovers. If the circular hovers are used, the young birds will get together under the middle, and there is no danger from overcrowding in broods of fifty chickens; but if the pipe brooders are used, the chickens should be placed under the middle of each brooder, rather than at one of the ends.

They do not need any food for twenty-four hours after hatching, On the morning succeeding their first night under the brooders, the chicks should be fed. Crumble up some crackers fine, and mix the crumbs with the yolks of hard boiled eggs, broken up fine.

The chicks will soon gather around the feeding dishes, if you will tap the end of your finger on the side of the dish in imitation of a fowl's bill in pecking, and in a surprisingly short time they will learn how to eat; you can teach them to drink also, by dipping your finger in the water dish and stirring it a little. As soon as one chicken learns to eat or drink, the others will follow its example, so that it takes but a very few minutes to teach a large number of chickens.

After the young birds have eaten, gently push them under the brooders, and they will remain quiet for a number of hours, and when they want to eat again they will run out and satisfy themselves, and then return to the artificial mother precisely as they would to the natural one.

As soon as it is dark, if the hot water pipes are used as brooders, the chickens should be gently pushed to the middle of the brooders; otherwise they will crowd against the supports of the pipes or the partitions between the pens, and crush the inner ones to death. It is absolutely necessary that this should be done if one expects to operate with success.

The young broods are now started, and if they are properly cared for, there is no diffi-

culty whatever in raising them. They should be fed as early as possible in the morning, and should have a variety of food, *and only as much as they will eat up clean.* It is a good plan to give them as a soft food for breakfast, mashed potatoes mixed crumblingly with Indian meal. In two or three hours they should be fed again, and now they should have fine cracked corn, or crumbled Indian meal cake (made by stirring up Indian meal with boiling water and a little salt and then baked in an oven), and wheat or wheat screenings. It will soon be found that they have a partiality for some one food, and will pick out the choice morsels, leaving everything else untouched. In order that they may have the greatest variety of food, and consequently consume the greatest quantity, instead of mixing their food, I feed them at each meal first with the article of diet that they least like, and when they refuse to eat any more I give them something else, finishing off with their favorite. The point to be aimed at is to induce the young birds to consume the greatest possible amount of food, by which means they grow and mature very rapidly, and I know of no better way of accomplishing this than that I have described. At night they should have all they will eat of cracked corn and other hard grains, soaked in water, so that their digestive organs may be well supplied until morning.

The water vessels during the daytime should always be kept well supplied with pure, clean water; nothing is more likely to create disease among chickens than filthy, impure water, and too much care cannot be exercised in this direction. The ground under the hovers should always be cleaned and renewed every morning; a supply of ground bone should always be accessible to the chickens, and once or twice a week they should have grass, clover, or other green food chopped fine when the chicks are small, and in the natural state when they are a few weeks old.

It is a good plan to sow oats in frames in the chicken house for the winter supply of the chicks, but cabbage chopped fine is about as acceptable. I have been accustomed to feeding the very young birds with cabbage and turnips, chopped fine and mixed together, and can recommend the practice as a successful one. After the chicks are a few weeks old I throw these vegetables to them whole; the time it takes for a flock to tear to pieces and devour a whole cabbage is surprisingly short.

The system of management that I have described has proved so successful with me that I can without hesitation recommend it to others; as by it I have absolutely no difficulty in rear. ing chickens artificially, and that, too, in our most inclement seasons."

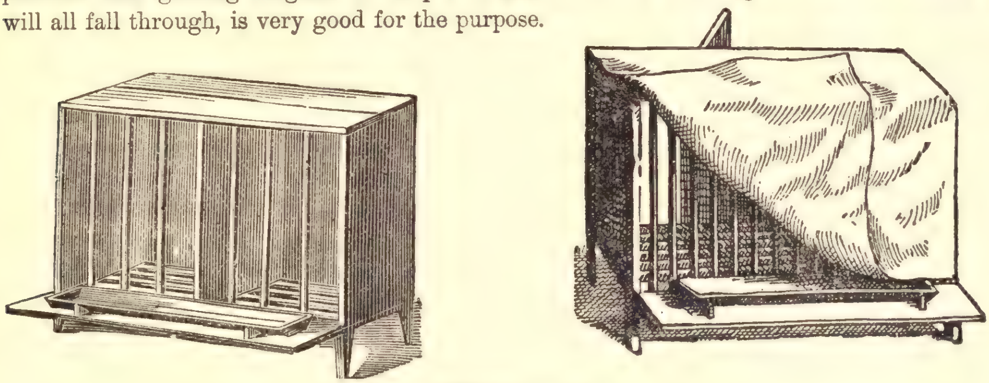
The brooders should have fine sand or ashes cover the ground under the brooders an inch deep, and this should be frequently changed in order to keep the surroundings as clean as possible. Cleanliness in their runs is likewise equally essential. The brooder, if neglected, is liable to get infected with vermin. To prevent this, dust sulphur or pyrethrum powder frequently into it. The true secret of success in raising chickens artificially may be condensed into a few words, viz., warmth, ventilation, cleanliness, and constant feeding, with a variety of suitable kinds of food. Let them also have the warm sunshine to lie and run in. Never permit the little things to go hungry, or to be neglected in any way; indifferent care will never prove profitable in poultry raising, and unless a person is willing to give his attention to it, he had better never undertake the business.

Advantages of Artificial Hatching.—While we do not believe any artificial means of hatching eggs will be found preferable to the old-time method of the "setting hen" when a small number of eggs are to be hatched, still where large numbers of chicks are to be raised, some advantages may be gained by the use of the incubator. By this means early chickens for the market and show-room may be procured; in fact, chickens may be hatched at any time during the winter, or at any time and all seasons of the year, as hens will lay well, when they will not always sit when desired; besides, when incubators are used, the hens that would be employed in hatching would be profitably engaged in supplying eggs. With

incubators, we may have chickens in December, as well as in June. When hatched in the winter, they will be more hardy, less liable to become diseased, and may be taken care of with less trouble, when there is a warm place provided for them; but if warm quarters are not provided, it will not prove worth the while to attempt it.

When chickens are hatched in warm weather, the sun burns them, unless there is an abundance of shade provided, while the excessive heat checks their growth, but not their appetites; hence, it will cost more to raise them, although they will not be ready for market or for exhibition in the fall when they should be fully feathered and nearly grown, to be best suited to either place.

Fattening Poultry.—If fowls are constantly kept in good flesh, it will not take long to fatten them. Most of the chickens found in the market are taken directly from the yards without extra feeding, but it will be found more economical generally to fatten them for from fifteen to twenty days before marketing. For this purpose they should be confined in a darkened coop, or pen, and fed three or four times a day all they will eat. The place of confinement should be kept as clean as possible, free from draught, and dry. It is better to pen them in small numbers, say from eight to a dozen in a pen, putting such together as have been accustomed to run together, otherwise they will be liable to quarrel, which will prevent their gaining weight. A coop with a barred floor, so designed that the droppings will all fall through, is very good for the purpose.



FATTENING COOPS.

The coop should be so arranged as to afford good ventilation without draught, and to be kept partially dark, with but little room for moving about much. The times for feeding should be regular, and the fowls given all they will eat. Corn meal made into a thick mush, thoroughly cooked, and fed cold, is excellent for fattening. A little corn may also be given. An excellent food for fattening fowls, whether old or young, is equal quantities of barley meal and corn meal scalded and fed warm. Fresh food should be given at each time of feeding, and only just what they will eat up clean. Keep clean water by them constantly, also gravel. Feed all they will eat, then darken the coop until the next regular time for feeding. Bits of fat meat will also hasten the fattening process.

By carefully watching, the proper time for sending them to market will be determined, which will be in from fifteen to twenty days. When the proper point in the fattening process is reached, they should be marketed immediately, as they will soon begin to shrink in weight. For home use there is probably no fowl meat equal to a chicken that has never been fattened at all, but having been well fed from the time of hatching, is taken directly from the yard.

The flesh of fowls that have always been well fed, will be much more juicy and rich in flavor than those fattened from a low state, and "crammed" just before killing. Poultry should never be permitted to range where they will pick up food unfit for them to eat, for it flavors their flesh and taints the meat. Chickens that have been obliged to pick up their

living from pig-sties, the barn-yard, and other unclean places, will not furnish as nicely flavored meat as those fed with clean, healthful food. A fowl cannot feast constantly upon filth and drink impure water, and furnish very delicate flavored or healthful meat for the table. Not only will the food eaten by fowls flavor the flesh, but the eggs also. Onions given to hens in large quantities will give a very decided onion flavor to the eggs. Chickens of the larger breeds will be grown enough for table use at from three to four months of age if well fed from the time they are hatched, while they are frequently used for broilers when from six weeks to two months old.

In France, and some portions of England, the cramming process is resorted to in fattening fowls. Two methods of this process are practiced: the forced administration of solid food, and that in a semi-fluid state. Buckwheat meal, bolted quite fine, is used mostly for this purpose. This is wet with sweet milk until it is of the consistency of baker's dough, when it is made into little rolls about the size of a lady's little finger, which are cut into pellets from an inch to two inches long. Each of these pieces of dough is dipped in water before being put into the bird's throat, when it will swallow it at once. The quantity given is according to the size of the fowl, care being used to increase the amount taken each day, to feed regularly, and never until the previous meal had been digested.

Killing and Preparing for Market. — Fowls should not be fed for at least twelve hours before killing; many prefer that they fast twenty-four hours. If killed with the crop and intestines full, the task of picking and dressing them will be much greater than if they were empty. Since poultry that presents the most attractive appearance in the market draws the most remunerative prices, it is the interest of the poultry raiser to kill, dress, and pack for market in such a manner as will insure the best condition. It was formerly the custom to wring the neck of the fowl in killing, but the better method of bleeding has become generally adopted. This is not only more readily accomplished, but the flesh is whiter than where the old-time method is practiced.

The best method of killing fowls is to open the beak, then with a pointed, narrow knife blade, make an incision at the back of the roof of the mouth, which will divide the vertebrae and cause instant death. The fowl is then suspended by the leg until the bleeding ceases. Dry picked fowls, or picking without scalding, when the fowl is quite warm, is the best way of removing the feathers, as poultry looks much better prepared in this way, and will generally bring a higher price in the market. If done when the bird is warm, it is a very easy task, and the skin will not be torn, while the extra price obtained will more than pay for the trouble. Fowls can be picked more easily by scalding, and this process also imparts to lean fowls a plump appearance. In scalding, care should be used not to have the water too hot; it should be just scalding hot, and *not boiling;* 190° is about the right temperature. Immerse the fowl, holding it by the legs, taking it out and putting it in again until the feathers come off easily. Do not let it lie in the water at all. Pluck the feathers off at once, and if properly scalded both feathers and pin-feathers will come off together. They should always be picked clean. Hang turkeys and chickens by the feet to cool, and ducks and geese by the head.

Fowls should never be sent to market undrawn; that is, with the internal organs left in. The undigested food in such cases soon enters into a fermentation, and putrefaction takes place, which in a few hours taints the meat, giving it an unpleasant flavor. The quantity of greenish looking fowls in the market are good illustrations of such results, while when cooked, will have a flavor that no amount of washing in soda water will obliterate, or high seasoning conceal. We are aware that it is customary in some markets to receive poultry undrawn, but if customers really understood the difference between fowls drawn and properly cleaned when dressed, and those drawn only as purchased in the market, they would, for sanitary reasons, as well as for delicacy of flavor in the meat, soon render the latter an unmarketable product.

Health, as well as other considerations, should be sufficient reasons why all poultry should be carefully drawn as soon as practicable after removing the feathers. In so doing, the opening should be made as small as possible, that the fowl may not look torn or mangled, and the heart, liver, and gizzard placed inside each fowl. In some markets the heads are left on, but we see no advantage in this. Hang the poultry up until quite cold and stiff, but never, under any circumstances, permit it to freeze. Hard freezing produces discoloration in the meat, and will depreciate the price in market.

Packing and Shipping for Market. — Having been well prepared for market by being carefully picked, the heads cut off and the skin drawn over the stump and neatly tied, — or when preferred, as is the custom in some localities, the head may be left on — the poultry should never be packed for shipment until perfectly cold; in fact, the nearer the freezing point, without being frozen, the better. The flesh should never be cut or bruised, or the bones broken. Clean boxes, free from dust, are better for packing poultry than barrels, as they are not so liable to become twisted out of shape in these as in the latter. Packages containing two hundred pounds are sufficiently heavy. When packing a variety of poultry, it is best to put different kinds of fowls into different packages, the kind being distinctly marked on the cover.

Clean rye or oat straw, free from dust and quite dry, is the best material for packing. This should be put at the top and bottom of each box, also at the sides and between the layers of poultry. In packing, the bird should be laid breast down, with the legs out straight, the head bent under and to one side of the breast bone. Lay a row of fowls across the box from left to right, packing close, row by row, until the place for only one row is left; then reverse the heads, lay them nearest the other end of the box, putting the feet under the previous row of heads. Fill all the interstices with straw to prevent shifting; also pack straw enough over each layer of fowls so that they cannot touch each other, and so proceed until the box is filled.

Straw should be liberally used at the top and bottom of each package, also at the sides and between the layers. There should never be any shaking about, or the birds will become bruised. The box should be firmly nailed, with the number of fowls and variety plainly marked upon it, also the name of the shipper, and the person to whom it is consigned, with the full name, street, and number. The receiver will therefore be more liable to get it promptly, and it will be known by a glance what the box contains without unpacking to find out.

Preserving Eggs.—Eggs that are packed in salt, in layers, with the large end down, so as not to touch each other, if put in a cool, dry cellar, will keep fresh from six to eight months, and can scarcely be distinguished from fresh eggs. Another method which is preferred by some is to add half a peck of new lime to four gallons of boiling water, stirring it well until the lime is dissolved; when cold, strain it through a course sieve to remove any hard lumps; add ten ounces of salt, and three ounces of cream of tartar, and mix the whole thoroughly. Let the mixture stand two weeks before using. The eggs for packing should every one be perfectly fresh. Pack them as closely as possible in a jar or tub, and keep them constantly covered in the pickle. It is said that eggs may be kept fresh by this means from one to two years. A writer in the English Mechanic gives the following method of preserving eggs:

"I have preserved eggs so perfectly that, after a lapse of six months, they were mistaken, when brought to the table, for fresh-laid eggs, and I believe they would have kept equally good for twelve months. My mode of preservation was to varnish the eggs as soon after they are laid as possible with a thin copal varnish, taking care that the whole of the shell was covered with the varnish. I subsequently found that by painting the eggs with fresh albumen, beaten up with a little salt, they were preserved equally well and for as long a period.

After varnishing or painting with albumen, I laid the eggs upon a rough blotting-paper, as I found that, when allowed to rest till dry upon a plate or on the table, the albumen stuck so fast to the table or plate as to take away a chip out of the shell. This is entirely obviated by the use of the blotting-paper. I pack the eggs in boxes of dry bran."

Breaking up Broody Hens.—Some breeds of sitting fowls are much more inclined to be broody than others, the Asiatics, for instance, being quite troublesome in this respect, while there is also quite a difference in individuals in the sitting propensity. Many of the devices resorted to for breaking up this tendency are either futile or cruel. It must be remembered that this inclination is a natural one, and will be likely to be persistently followed until the fever is over, or some sensible means adopted to break it up. The cruel practice of ducking hens in cold water, tying them by the leg to a stake in the open air or sun, shutting them in a darkened and almost air-tight barrel, or throwing them off their nests a dozen times a day is all to no purpose. The better way is to let the hen sit a few days, and then remove her from the nest to a coop or some other quarters where she cannot have access to her former laying place, and she will give it up entirely in about three days after confinement. This will give her a little rest, which she needs, and she will soon go to laying again. It is well to have a large coop or department of the hen-house especially devoted to this purpose, where broody hens can be shut up apart from others until the fever is passed. If it is desired not to allow the hen to sit at all, she should be looked after at night; when found at this time upon the nest, remove her from it entirely before the sitting propensity has fairly become established. If put in a small coop by herself, being supplied with food and water, she will forget all about it in three or four days. When two or three birds are broody at the same time, it is a good plan to put them in a coop or pen together, and introduce a young cock to keep them company. Three or four days will usually prove sufficient time to break up the inclination, when they will give no farther trouble for a time.

Preparing for the Shows.—As all admirers of fine fowls are more or less interested in poultry shows, we give some excellent hints from Mr. I. K. Felch, with respect to preparing the birds to make a creditable appearance on such occasions: "The chicks that stand head and shoulders above the brood in which they were hatched, are to be given private quarters and extra care; their meals should be cooked, and the growth of their different parts watched, and nature aided in all ways possible. Care and watchfulness are the levers that move the poultry interest, and are the cause from which the results—prize chickens—are obtained. Ninety points in an adult cock require a cockerel to score ninety-three, hence we see in chicks, "the child is the father of the man."

Why do we have no more nice cocks? The reason, in most cases, is that three-fourths of all the cocks moult in confinement. If we would have fine plumage, we should give them a fair chance to grow it while moulting. Rich, nurturing food, a chance to exercise, milk, and green vegetable food, are the requisites for the making of a prize winner. To reach above ninety points is to be quite sure of first prize, and three-fourths of the first-prize cocks score from eighty-seven to eighty-nine. If the breeder will think of these things while the birds are moulting, an extra point may be obtained, and success made certain. As the twig is bent the tree is inclined. If a flight feather in the chicken is left to fold outside, the adult set will be inclined to come in the same ungainly way. Pull the loose feather and allow the wing to fold, and the new set will grow out in proper shape. If the old feathers do not come out evenly, remove the tardy feathers so that the bird may secure its plumage in a smooth and even color. If a buff, you must know that a feather coming in long after the moulting, has a darker, fresher look, which makes the plumage uneven in shade. If the old ones are left, they are faded, and give the plumage a 'mealy' look. So, if neglected, one is sure to have two shades of color, which, being cut a point, destroys the chance of success. See that the old feathers fall in time.

In Hamburgs it is quite common in the show-pens to see specimens where one-half the flight-feathers are the old ones, never having been shed. When you see the flights half or two-thirds cast, and the new feathers just starting, catch the fowl and remove the rest. Just so with the chick. Many of you have seen me pull feathers in a show-room with the remark that they were chicken-feathers. The feathers next to the last coat before a bird comes into reproductive life, have a thin-pointed end where birds have been confined; these, many times, are late in moulting out. Care in this respect, especially in Plymouth Rocks, should be taken to see that they are shed in time to get their new ones before the exhibition, and may save you the disappointment of losing a first prize. These are old stories to us, but if by calling attention to them one nice bird may be saved to win, we shall not regret the writing."

Moulting.—This is the most critical period for fowls during the whole year. It is the time when there is a strain upon the system, required in the casting off of the old and the production of a new growth of feathers, the manufacturing of their new suit of "winter clothes;" hence there is an extra demand upon their physical energies. We prefer to see fowls moulting quite early in the autumn, thus putting off their summer clothes and preparing for winter before the cold weather has fairly commenced. Early moulting indicates a healthy condition, and when it occurs the process is apt to be gradual, while if delayed until cold weather, the feathers generally fall off rapidly, leaving the hen in such an unprotected condition that she suffers extremely from the cold, and sometimes dies from the effects, or if she recovers, is not generally worth much. Late moulting indicates exhaustion from constant egg-production or other cause. During the moulting season hens are more delicate than at any other time, and require extra care. They seem to feel badly, and frequently mope about as though sick.

It should be the aim of the poultry keeper to favor early moulting, and to make the season as short as possible. This may be accomplished by giving such food as will induce a growth of feathers. Feathers are largely nitrogenous in their composition, consequently the food for poultry previous to and during the moulting season, should be such as has a large proportion of nitrogen. When fowls are allowed the freedom of extended ranges, like that of the farm, for instance, they will seek worms, grasshoppers, and other insects for themselves, which contain large proportions of the nitrogen element. If hens are confined where they cannot obtain such food, they should be fed with meat scraps, bone meal, or something of that nature that will furnish material for the growth of feathers.

Sheep's pluck, refuse from the butcher's shop, etc., may be obtained at slight expense, and make excellent food for this purpose. Oats and hemp seed are good for feeding at this season. Fowls should also have a little cayenne pepper mixed with their food, and be liberally supplied with lime in some form, such as powdered oyster shells, old plaster, egg shells, etc. Mr. Wright recommends that sulphate of iron be mixed with their drink during the moulting season and cold weather; the preparation being half a pound of sulphate of iron and one ounce of sulphuric acid, dissolved in two gallons of water, this to be added in the proportion of a teaspoonful to each part of water given the fowls. It is also highly important that hens be provided with warm quarters, and proper shelter during this season. Very comfortable henneries may be constructed with but little labor and expense, where more elaborate buildings are not desired, and will well repay the trouble of providing them.

Feather Eating.—This is an annoying and unnatural habit, that seems to be formed under confinement, and from a lack of exercise and want of meat and green food. We have frequently seen fowls stand perfectly still, and apparently contented, and allow another to pluck the feathers from the head or other portions of the body until the blood flowed, showing no indication whatever of pain or discomfort. This habit is imitated by others in the flock, and spoils the appearance of fowls. It seems to be a habit contracted in part from mere idleness—the want of something to do. Give the fowls a wider range, more exercise,

a variety of food, consisting of meat scraps, grain, vegetables, shells, bone, etc., together with finely cut, well-cured rowen hay. Corn fodder is also excellent, and should be kept by them. It is surprising what an amount of green food fowls will eat when permitted to have constant access to it.

Egg Production. Quality of Eggs, etc.—There has been considerable discussion among poultry breeders relative to the number of eggs which may be produced by a hen in a year. We believe it is generally conceded by those who have given the subject much attention, that with the best breeds for egg production the number of eggs will average from a hundred to a hundred and seventy-five per year with proper care, while even higher numbers may be reached in individual cases. Mr. A. M. Halsted says: "Some years since a tabulated statement went the rounds of the press, showing that a hen could not possibly lay more than six hundred eggs in the course of her natural life.

This number was parcelled out as follows:

The first	year after birth	15	to 20	The fifth	year after birth,	60	to 80
" second	" " "	100	" 120	" sixth	" " "	50	" 60
" third	" " "	120	" 135	" seventh	" " "	35	" 40
" fourth	" " "	100	" 115	" eighth	" " "	15	" 20

This table was assumed and based upon a microscopic investigation of the ovarium of a hen, by some European savant. For once, science was wrong. Within the past five years, a number of persons have kept careful count and have found an egg-production of nearly one thousand, during the eight or nine years of a hen's life. I, myself, have had a yield of over three hundred and fifty eggs per hen, in two years; averaging one hundred and seventy-five yearly, from a flock of Crèvecoeurs, and my Brown Leghorns yearly exceed that record. Two years since from a flock of sixty-one hens at first, of which two died in February and March, and thirty-four were killed for the table prior to July, I gathered between January 1st and September 1st, sixty two hundred and fifty-seven eggs. Taking forty-three as the average number of hens through the season, this gives an average of one hundred and forty-five eggs per hen, for eight months. Of these sixty-one hens, only twenty-five were Brown Leghorns; six were Light Brahmas; four Plymouth Rocks, and the rest were crosses and mongrels. Had the flock been all Leghorns, I have no doubt but the average would have been fully one hundred and seventy-five eggs per hen.

This production of eggs may be forced by suitable feeding, and, in breeding for profit, it should be done. Assuming the table given above to be correct in the *proportion* of eggs laid at certain ages of the fowl, it follows that to get the full value of the egg-production, we must keep her until the fourth year. If, by proper feeding and attention, we can cause her to lay three-fourths, or more, of that possible number during the first two years, we can then fat her for market, and fill her place in the yard by younger fowls, to go through the same forcing process. It is folly to feed and keep a hen four years, when the bulk of profit may be obtained from her in half that time. I should, therefore, advise fitting her for market as soon as she has finished the best of her second season's laying, which is usually about June. The cocks may be kept until three years old if desired, but usually two years will be found the most profitable age to market them.

In the 'old times' it was a good flock of fowls which averaged fifty eggs per hen per annum. Now an average of one hundred is esteemed a low figure; one hundred and fifty per head being considered the necessary number to entitle a flock to be called *good* layers. We frequently hear of instances where an average of two hundred and upwards have been produced by small-sized flocks, but these are exceptions to the rule. In eggs, the improvement of quality is equally noticeable. The idea that '*an egg is an egg*' no matter whether fresh or stale, whether stringy and tasteless, or meaty and rich, has exploded. We find as much difference in the quality of eggs, as with any other article of food; the quality

being practically under the control of the breeder. If the fowls have to shift for themselves, getting a precarious living in the barn-yards or the stubble field, the eggs do not have the rich melting quality which results from a good generous diet of grain and prepared food. We might as well expect the same quality of beef in the half-wild steer of the prairies, as we get in the well-fed thoroughbred Short Horn."

Profits of Poultry Raising.—That poultry raising is always attended with profit is a question of grave doubt, but that it may be made very profitable when properly managed admits of no question whatever. In fact, we believe that no department of farm management can be made more profitable to the farmer in proportion to the labor and outlay than poultry raising, when conducted according to the most approved methods. When the most profitable breeds are kept, and are judiciously and systematically cared for, so that eggs may be supplied in abundance during the winter, when they will bring the highest market price, and chickens hatched early to supply broilers for the market, when such meat is most in demand, the profits must of necessity be very large in proportion to the amount expended for their production and growth. The same principle holds true where poultry is raised simply for home use.

Like every other kind of business, the profits in poultry raising will be found to be proportionate to the amount of intelligent skill and care bestowed upon the enterprise. There are three distinct markets that poultry may be bred for, viz.: fancy strains, table use, and egg-production. Which will return the greatest profit for the time, labor, and outlay in money will depend considerably upon surroundings and conditions; under any circumstances the profits will depend upon the manner in which the management is conducted. A person should never go into the business with the idea that there is no labor attending it. There is profit in the business, but in order to secure it there must be labor, and a judicious system. To show what the average profits of fowls may be when properly managed, we give the result of a few experiments, on a small scale. The writer, in keeping an accurate account of the expenses and products from a flock of twenty-five Light Brahmas for one year, found that the net proceeds were about two dollars and a half per head, and this when grain was at a high market rate, and bought in small quantities at retail prices.

Mr. S. A. Cooper, of Colebrook, Conn., states that he had a flock of ten White Leghorns hatched June 2d. On the first day of the December following two of the pullets commenced laying, and in five days from that time the ten were all laying. Between the first of December and the first of April these White Leghorns averaged in eggs produced $1.10 each above the expense of their keeping. Mr. Edward Hunter, of Norwich, Conn., says that he found by keeping a strict account of the expenses and returns from his flock of one hundred and twenty-five hens, made up of Leghorns and Plymouth Rocks, that from March 1st, 1882, until March 1st, 1883, his hens laid 15,600 eggs, or an average of 116 eggs apiece. Of these he sold 1,200 dozen, receiving therefor $375.75, or an average of thirty-one and a quarter cents a dozen. This left him for use in his own family 1,200 eggs; that is 100 dozen. He is satisfied that he made enough off from the hens, to say nothing of eggs the family ate, to pay for the keep of his horse and cow.

The following is an account kept by a young lady in New England, who experimented in the profits of poultry raising. The number of hens kept was sixty, consisting of White Leghorns, Dark Brahmas, and American Dominiques:

No. of eggs sold, 417 10/12 doz. at 29 1/5c., ...	$121.76
Amount of poultry sold, ...	114.23
Amount of poultry used in the family, ...	20.00
	$255.99
Amount expended for feed, ...	60.08
Leaving a net balance of, ...	$195.91

This gives an average of $3.26½ per head for each of the sixty fowls.

Miss Mary Reed, of Amenia, N.Y., gives the following from her poultry account book: Year ending March 31, 1877—eggs laid, 3,842; sold, 246½ dozen at 23 cents, $52.84. Fowls sold, 239 at $45\frac{8}{10}$ cents, $109.56. Total income, $162.40. Total expense, $60.14. Profit, $102.26. There were fifty-eight hens at the beginning of the year. Year ending March 31, 1878, number of hens 60; eggs laid, 4,377; sold 317⅓ dozen at 21 cents, $66.59. Fowls sold, 171 at 42½ cents, $72.72. Total income, $139.31. Expense, $37.15. Profit, $102.16. The average number of hens 35⅓: average eggs per hen, 121. Net profit per hen, $2.90. Year ending March 31, 1879, 54 hens; eggs laid, 4,269; sold, 291¾, dozen at 23½ cents, $68.71. Fowls sold, 294 at 44 cents, $129.02. Total income, $197.73. Expense, $40.82. Profit, $156.91. Year ending March 31, 1880, 65 hens; eggs 5,257; sold, 393⅓ dozen at 22⅓ cents, $88.45; fowls sold, 177 at 46⅔ cents, $82.75. Total income, $171.20; expense, $27.75; profit, $143.45. Year ending March 31, 1881, 64 hens; eggs laid, 5,566; sold, 423⅔ dozen at 24 cents, $101.68; fowls sold, 139 at 42⅔ cents, $58.98. Income, $160.66; expense, $32.60; profit, $128.06. Average number of hens, 48; 116 eggs each; profit per hen, $2.66.

In stating what women have done in poultry raising, Fanny Fields gives the following results from her observation and experience, which is certainly encouraging to farmer's wives and daughters in attempting to make a profit with but comparatively little outlay in money and, labor and realize at least a little "pin money" from the enterprise; besides the occupation is pleasant and healthful, as it necessitates some exercise in the open air, and which would not probably be taken, were it not for some specific object like this:

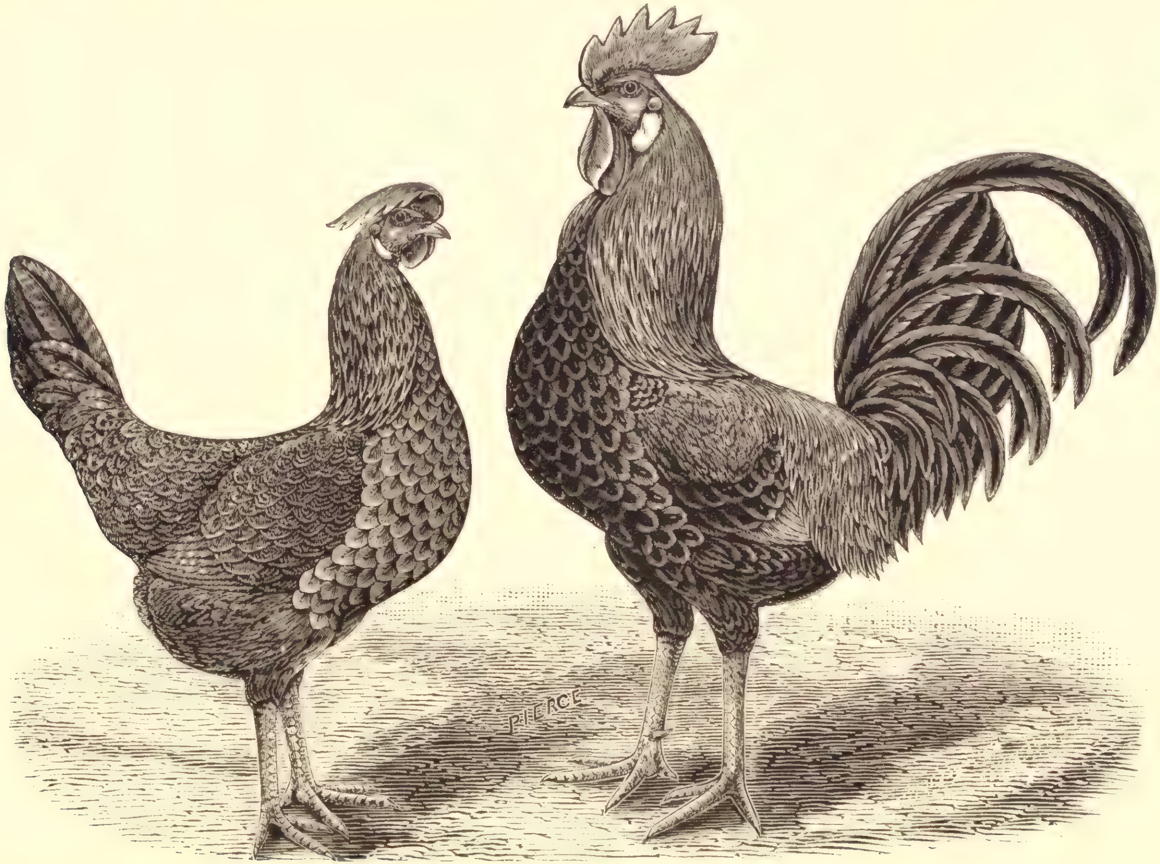
"Ten years ago a woman who lived in a large New England village was left a widow with four children and a little less than $300 in money. Friends, after the fashion that friends have at such times, advised her to put the children out, and perhaps she could support herself by sewing or teaching; but like the plucky New England woman that she was, she made answer: 'My children shall not be separated while I have health and strength to work for them.' She rented a house with a few acres of land adjoining, invested the greater part of the $300 in poultry feed and fixtures, and went to work. The friends predicted a speedy failure. 'Did she expect to support a family of five on the profits from a few chickens?' 'Yes, I expect to do just that,' she answered. 'When I was a girl I always managed the poultry on father's farm, and as I made it pay then I see no reason why I cannot make it pay now.'

'You'll see,' said the wise ones. 'It's our private opinion that you have thrown away the little money that you had. Five dollars for a rooster!' and eyes were rolled up and heads shook over the 'shiftlessness' of the woman who paid 'five dollars for a rooster.' Last winter we met this woman at a poultry show, and she told me of her success. She had educated her children, paid for her little farm (worth $800), and had $300 in the bank.

Another woman, whose husband fell from a building and was crippled for life, took up poultry raising because it was the only thing she could do at home; that was thirteen years ago, and to-day she owns a fine farm well stocked, and has money in bonds and in the bank.

A young woman whose health failed in the close confinement of the school-room, went to raising poultry because she was obliged to do something for a living, and because the doctors advised mental rest and as much active out-door exercise as possible. In two years her health was firmly re-established, but in the meantime she had found poultry keeping so pleasant and profitable that she refused to teach again. She has been in the business five years, and is earning a fortune as fast as ever a pair of woman's hands earned one.

Last year the writer made a profit of almost $1,000 on a breeding stock of some two hundred chickens, ducks, and turkeys. I don't publish this to boast over my success, but to show other women what a woman can do under the most favorable circumstances. The



BROWN LEGHORNS.
Owned by C. A. Keefer, Sterling, Ill.

favorable circumstances in my case were a splendid stock of breeding fowls, a healthy location, a thorough knowledge of my business in all its branches, and nearness to a first-class market. Of course some doubting individuals stand ready to declare that it is impossible to make five dollars profit on every adult fowl kept; but if they will stop and consider that I get spring chickens into market during the months of April and May, when they sell readily for one dollar each, that I sell ten and twelve pound capons for thirty cents a pound, that I manage to have eggs to sell in winter when I can get from thirty to thirty-five cents a dozen, and that I sell a few trios of exhibition birds every year, they will see where the big profit comes in.

Now don't stop here and give up all thoughts of raising chickens just because you cannot get such prices in your locality, but wait until I give you a few hints from my experience. I have kept poultry in the West where eggs sold at the stores for eight cents a dozen in the summer, and poultry sold in the fall for seven cents a pound, live-weight, but I made it pay. We lived on a line of railroad two hundred miles from a city market, but I soon found out that all the poultry and eggs from our place went to the city, and I could not for the life of me see why I could not ship such things just as well as the merchants. So I sent a thirty-dozen package of fresh eggs to a commission house in the city; they sold them readily, and there was a call for more. 'These small packages of eggs, every one warranted fresh, are just what we want,' wrote the commission man. I did some more thinking, and then put on my good clothes and went to the city. Once there, it did not take me long to find a grocer who wanted thirty dozen of fresh eggs every week, so I shipped the eggs direct to him, and saved the commission man's profit. In the fall I sold my poultry in the same way.

There was no thoroughbred poultry in the vicinity except that in my yards, and when people began to find out that my chickens were superior to the common mongrel fowl, they bought a great many eggs for hatching. There was not one pair of any of the improved varieties of ducks in the county. I sent a thousand miles for a pair of Pekins, and within a month after they arrived every body had the duck fever, and I was overrun with orders for ducks before a single egg hatched. I also procured some Bronze turkeys, and sold every egg that I could spare, and every turkey I raised at good prices.

Every woman who goes into poultry raising may not be able to get in these 'extras,' but every woman who desires to earn money by raising poultry, and goes into the business with a determination to succeed, will be sure to make it pay, even if she sells every egg and every chicken at market prices."

DISEASES OF POULTRY.

THE following on diseases of poultry was prepared especially for this work, by Mr. G. P. Burnham, a breeder of poultry for more than thirty years. Unlike many writers on this subject who enumerate forty or more diseases as applicable to the condition of fowls more or less frequently during their existence, he claims that the number of diseases commonly known to afflict the poultry race are few, and that many of the so-called diseases are but phases or different types of the same disease; that the primal or chief diseases of poultry may be set down pretty accurately in a very brief summary, although the following category are often seen described as being common to domestic poultry:

Apoplexy, Asthma, Roup, Vertigo, Paralysis, Indigestion, Catarrh, Canker, Pip, Colds, Gapes, Snuffles, Sore head, Hoarseness, Crop-bound, Inflammations, Drooping, Diarrhœa, Constipation, Dropsy, Scaly legs, Loss of plumage, White Comb, Black Comb, Diphtheria, Vermin, Lethargy, Rheumatics, Cramps, Dizziness, Egg-eating, Bumble-foot, Gout, Feather-

eating, Collapse of Muscles, Debility, Breaking down in the Limbs, Egg-sac Rupture, Dysentery, Fevers, Moulting, Cholera, and *other* afflictions unknown.

Here are some forty, only. Now of this extraordinary list of *so-called* "diseases" among poultry, there are but about half a dozen actual ails which domesticated fowls are generally subject to, that go to make up this elongated, horrifying list. And these, as a rule (not of course invariable, because there are exceptions to all rules), are in the main manageable, preventable, or curable — through the exercise of a goodly share of common sense, a little ordinary intelligence, some practice, and a kindly disposition towards the sufferers.

Roup, for instance, in its various phases, is simply catarrh, diphtheria, hoarseness, snuffles, inflammation in the throat and nostrils, a cold, sore head, diarrhœa, loss of appetite, lethargy, drooping, cramp, asthma, dizziness, general debility, fever — and death. This is ROUP — *pluribus in unum* — many in one.

We propose, therefore, to consider the Diseases of Poultry under five or six general heads, only; inasmuch as, if we take cognizance of ROUP, INDIGESTION, external and internal INFLAMMATIONS, LICE, CHOLERATIC attacks, and accidental affections, we may account for the causes and effects of all the ills otherwise named by astute poultry writers of former or more recent times.

In *all* cases it is necessary that the fowl-doctor shall know what the trouble actually is, when he is about to attempt to administer relief to ailing birds. With this foreknowledge a great deal of unnecessary fowl-murder may be avoided.

Chicken Cholera—So called, is a new disease in this country, about which but little is known in New England, and which has been treated with but indifferent success at the West and South, where it is stated to have largely prevailed in the past ten years. From all we have seen and what we have read on the subject, however, we have formed an opinion upon this ailment; and we will briefly state our views about what is denominated "chicken cholera." It is a curious complaint, which we in the North have had little experience with, except in its mildest and manageable form. The symptoms are those analogous to a sudden attack of violent diarrhœa; preceded by lassitude, sluggish movements, early prostration, and a general inertness in the victim assailed.

After death, which ensues in a brief space of time succeeding the attack and rapid sinking of the fowl into semi-unconsciousness, the liver is found to be swollen and flabby, the crop distended, the stomach foul, the gizzard filled with dried food, and the entrails inflamed. There is, previous to death, a sharp diarrhœa, wasting the life out of the bird, which ordinary treatment does not appear to affect or check at all. And from these indications and symptoms (which are not unlike some of those attending the Asiatic scourge in man) this disease has been denominated *cholera*.

Mr. W. H. Todd, a noted Western breeder, has had some experience with this fowl trouble, and he states that much of what is *termed* cholera is something else. He has once or twice fancied that his flocks had a touch of a disease akin to the reputed "fowl cholera." But he checked this (whatever it was) by the free use of carbolic acid disinfectants, and subsequently by thoroughly purifying his hen houses by fumigation.

We read that desperate diseases demand the application of desperate remedies, and in several instances where the premonitory symptoms have thus shown themselves, the alarmed owners of the menaced fowls have administered calomel and blue mass—in two-grain doses, or four grains of blue mass mixed with two grains each of gum camphor and Cayenne pepper—say twice a day. This we should say would either kill or cure, certainly! In the cases referred to, the experiment proved fortunately successful; albeit the owners acknowledge that they were not positive that the threatened disease "was really *cholera* or something similar."

It has proved quite contagious, nevertheless, in certain districts. And yet it is clearly

of a typhoid dysenteric character, from the outset. The remedial treatment thus far experimented with has not been encouragingly successful, inasmuch as most of those who have suffered from its presence among their stock, have acquired no knowledge of its cause, or what mode is best to adopt as a curative. Meanwhile the malady is of so violent a character that when it comes upon their premises, their birds die by scores, before they can decide what is the real difficulty, or how they may contrive to relieve them. We have no doubt that bad *locations* have much to do with this trouble. And we seriously opine that if seen to at once in most places, and (as in Mr. Todd's case) treated vigorously—*as for malignant dysentery, or inflamed diarrhœa*, the birds may be saved, in many instances.

But—as in all other cases of fowl disease which we have herein noted—we claim that if the chicken premises are kept uniformly cleanly and sweet, if the hen-houses are not overcrowded and are daily well-ventilated, if the stock is fed judiciously with sound and varied food, if the poultry is kept free from lice, and are housed comfortably in cold and bad weather, and pure fresh water is furnished them, always—there will be little or no "chicken cholera" about.

If we have had this distemper in New England at all, it has not been of a serious character. It may be that our climate here favors us in this respect. But all the complaints that reach us come from the west and south, and there this plague has been very troublesome and severe. Wherever our attention has been called to this illness, we have, upon examination, found the ailment to be a phase of slow fever, at first, and subsequent virulent diarrhœa.

In these instances the birds have gone down gradually, but constantly, in condition, for weeks from the beginning. Up to within a few days or hours before death, they have eaten well—evincing continual thirst. Then diarrhœa has set in sharply, and they have expired. I consider this clearly a phase of dysenteric *roup*—and for this only should I treat the affection, if it should exhibit its symptoms in my runs.

But there exists some *local natural cause* for this wholesale destruction of domestic birds in certain districts, unquestionably. This malady is largely fatal in its work, and in the west it is clearly of a destructive character. It is said by those who have examined diseased yards that the cause has been found to have been generated in the place or its immediate vicinity (in several cases) where the trouble was most fatally severe. And this ruin was occasioned by the miasmatic, putrid, filthy condition of the soil (and neighborhood) where these fowls had long been kept.

Now the *cause* for this generation of malignant disease should not be suffered to exist at all. Fowls cannot be kept in or upon such infected disordered foul spots. And the remedy —to begin with—must be to remove the living stock beyond the baleful influence of such miasmatic death-districts, or apartments, or else remove the putridity, filth, and poisonous deposits (whatever they may be) from the fowl premises, and their neighborhood. The trouble is no doubt brought about, in the first instance, from the exposure of the stock to infested, swampy, or foul grounds and runs—or by keeping the birds in contiguity to such miasmatic or befouled premises. This disorder exhibits many of the symptoms which are premonitory in human beings afflicted with malarial *cachexia*—such as a paling and sallowness in the features, loss of flesh and condition, rapid diminution of muscular strength, general nervous lassitude and prostration, and the liability at any hour to sink suddenly under any incidental disease that may assail the subject, at such a time. The approved remedy for this affliction to *humanity* is the removal of the patient entirely from the vicinity where the affection originates to a purer atmosphere, and uncontaminated soil. And, subsequently, to restore the stricken bodily system through wise treatment, good food, and sustaining tonics.

A similar method would, in our judgment, unquestionably recruit a body of domestic fowls—but the suggested remedy should be seasonably applied. And the sooner this change

is made, upon discovering the above noted choleratic or malarial symptoms, the greater the proportion of birds will be likely to be saved from death, after being attacked by this "chicken cholera." If we should find it breaking out in our runs, *we should directly apply the remedies we have suggested for aggravated dysentery.* But so long as fowls are housed and kept, sheltered and fed, as we have long been in the habit of attending to ours, we do not fear any of these disastrous visitations among our flocks. We reiterate the convictions—impressed upon us during long years of practical trial and experience in this business—that cleanliness in the fowl houses, dry soil in the runs, pure air and plenty of it, proper ventilation at all seasons, good varied food, attentive care, fresh, untainted water, absolute exemption from vermin, and a love of the occupation, are the requisites towards breeding poultry advantageously; and these comprise the necessities for keeping them in good health, and continuous thrift.

Indigestion, Inflammation, etc.—Ordinary indigestion in fowls is of two kinds, and operates disastrously upon the crop, the stomach, and the bowels. Undigested food halting in the crop —whether dry or fluid—causes aggravated swelling and distention; the contents become hard and cakey, or puffy and watery, as the case may be. The disease is sometimes slight and temporary in duration, working itself off without inconvenience save through causing the bird to fast, by the removal of food from within its reach, for a day or so. In other and more numerous instances, however, the fowl becomes "crop-bound," after a while, and the contents of this first receptacle for its food grows hard and harder, still swelling more and more, until it must be relieved of the sodden load, or the bird will die. The process of remedy for this difficulty is simple, but it must be deftly and carefully performed. An opening should be made by one person, while another holds the bird, by an incision in the outer skin of the swelled crop, at the upper side—and through this horizontal slit, say two inches long, the caked food may be turned out slowly and cautiously, until the offensive undigested matter is removed.

Then, with a sharp fine needle and white silk (for most colored silk poisons the flesh), the edge of the opening should be neatly sewed together again. The relief will be immediate. The bird should be fed sparingly for a week afterwards, on cooked soft food, allowed little drink meanwhile, and it will commonly recover. All this (as in other cases of chicken-doctoring) is not worth the trouble involved, unless the diseased fowl be a valuable one. Indigestion generally causes inflammation of the gizzard and liver, and the bowels become constipated, in consequence. But most commonly it operates quite oppositely, and diarrhœa or dysentery is the result. In the latter case, the character of the affection is readily seen in the frequency and nature of the abdominal discharges. White and streaked, yellow, thin matter is voided. The bird rapidly loses flesh, and becomes weak and listless. And in a few days the disordered intestines are highly inflamed.

If attended to seasonably, the progress of the unnatural discharges may be without much difficulty arrested; and the fowl comes up again as rapidly as it went down, in spirits and strength. The evil may have been occasioned by the indulgence in too much green food, which sours and ferments in the crop or stomach, sometimes; or it may have been caused by exposure to wet and cold, or bad dry food, and "damaged" corn. Change the diet at once, in either case. Give drink sparingly, and only such as is impregnated with iron tincture, or cayenne pepper. Administer a few grains of dry ground rhubarb with as much common black pepper and powdered chalk—mixed in mashed boiled rice. This will shortly cure the bird, in ordinary cases. We do not advise the use of opium (as some do) and have rarely found any benefit from it. When the fowl is brought so low as to require this powerful astringent—or, on the other hand, to need mercury, or even "blue mass"—we have not deemed it worth while to resort to the sometimes recommended agencies; having little faith in the efficacy, save *in extremis.*

Indigestion will cause dysentery, diarrhœa, constipation, stomach cramps, swelled crop, loss of appetite, fever, and general disorder in the internal functions. Thus, under one head we refer to all these, and advise due care in feeding, and properly contrived quarters for sheltering, at all seasons, as a prevention to this not uncommon malady among poultry. The symptoms of this trouble are very plainly exhibited, when a domesticated bird is affected by it seriously. There is no mistaking the fluid discharges, the straining to void this mucus, the rapid decline in the flesh, and the spiritless condition into which they droop, after a brief term. And it will be necessary to look to them promptly and energetically, as soon as the indications mentioned are discovered—or they get beyond the reach of doctoring, from the excessive internal and intestinal irritation occasioned by this indigestion, and their continuously ineffectual exertions to relieve themselves, in the natural way. But this irregularity, like other diseases, must not be mistaken for what it is *not.*

Lice.—Though not of itself literally a *disease*, the presence of house and body vermin is absolutely the great cause of more torment, sickness, and destruction to chicken and fowl life than *all* other evils to which poultry is subject. Young birds are more frequently killed from being infested with lice on the bodies, in the nests and coops, or about the roosts they frequent, than through all other causes poultry-keepers wot of. There is no controlling the depredations of these insidious parasites, save by their extermination, and this can be effected only by constant care and vigilance. The whole feathered tribe (in a domestic state) is peculiarly subject to this infection. Many persons who keep fowls, pigeons, or pet cage-birds, do not understand this. And rarely taking effective measures to prevent their accumulation, they know not why it is that their fowls fail, droop, sicken, and die—one after another, from no apparent organic indisposition. The trouble is they have been "eaten up alive," by vermin.

Upon young chicks of the crested variety, such as Houdans, Polands, etc., the tufts of their heads are a favorite shelter for vermin; and hundreds are thus destroyed, annually, by these parasites. Great care should be exercised by breeders of these varieties, to keep their chicks free from this nuisance. It is not sufficient that you clear out this pest once, or twice, or thrice. If you continue to breed fowls, you must not only continue to drive these parasites away, but you must keep them at a distance—or they will beat you, in the end. Lousy fowls are never healthy, and are usually short-lived. Three-fourths of all the chicks that die before they are two months old, are killed by vermin. And those who lose them can never account for the fearful mortality accruing among their chickens. But all this destruction may be avoided, and there is a certain remedy for this offensive and troublous nuisance; which precedes and fatally aids the inception, progress, and finale to all other described "diseases," save those of accident or inheritance.

Prevention *of the possibility of their presence* to any extent, in your hen-houses, or upon the bodies of the fowls, is the only positive cure for this evil. To effect this, the building, however economically constructed—should be of dimensions proportionate to the number of birds you keep under a single roof; and these should be rendered comfortable for the stock. When you first place fowls within the house, see to it that *every* bird is cleansed from lice, before he or she enters it. Don't *begin* at the wrong end, by putting lousy fowls into a new or clean hen-house. To clear them of parasites, rub dry powdered sulphur, or carbolic powder, thoroughly through the feathers (to the skin) of adult fowls; and under each wing of cocks and hens, smear a little mixture of lard, sulphur-dust, and kerosene—as well as a dab of this also at the back of the head, and around and above the vent. Follow this up (outside your clean house) for three days—and you will thus, when you introduce your birds to their chosen premises, carry in no vermin from the commencement.

Upon young chicks, the lard and kerosene should be dispensed with. The powdered sulphur alone, or the carbolic powder, if thoroughly applied, is sufficient on their little bodies;

and the other is too pungent and penetrating, until they are older, and tougher-skinned. Now, sponge the roosts once in a week or fortnight with kerosene, or spirits of turpentine. Do this in the day time. It will thus dry off or evaporate mostly by nightfall. The *fumes* remain, however, and these are death to the parasites, if any are about. Next, dust the laying-nests and the sitting-coops, with the sulphur. Place under the straw where hens sit dry tobacco leaves, if convenient. And upon the bottom and sides of nest-boxes rub the kerosene, occasionally.

Figs. 1 and 2 represent the mammoth body insects (largely magnified), that burrow among the down of geese and upon the thick under-plumage of the peacock. Fig. 3 represents the duck-louse, an insect that seeks shelter on the soft downy feathers of the duck.

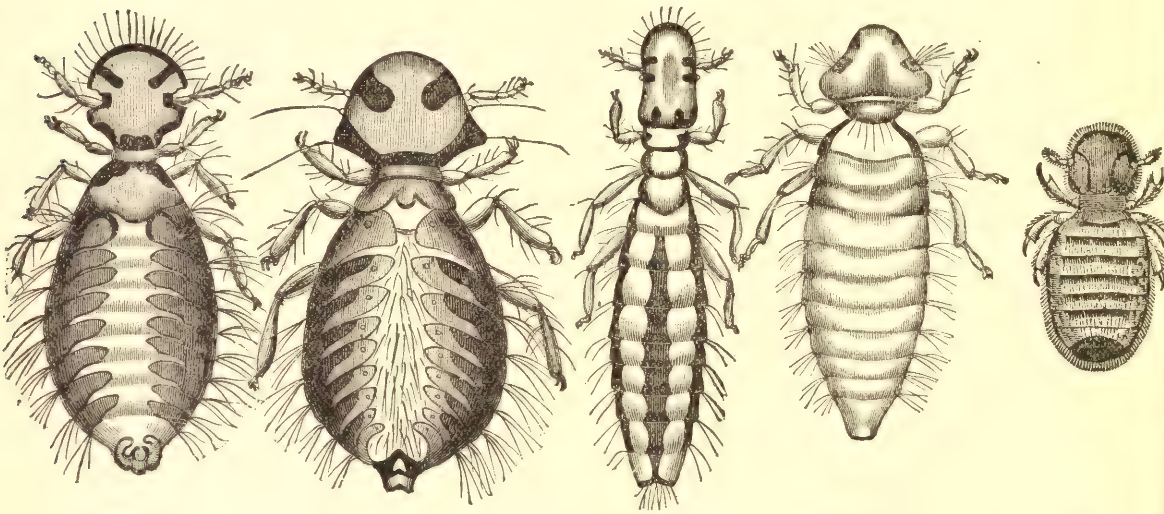


FIG. 1. FIG. 2. FIG. 3. FIG. 4. FIG. 5.

POULTRY VERMIN.

They are not usually very troublesome to the old duck except when confined in close quarters, and especially when sitting. They are a rapacious little insect, and the ducklings will be liable to become infested with them unless the mother has been cleansed before leaving her nest with her young flock. Figs. 4 and 5 illustrate the lice most commonly seen upon hens and chicks. These are but a few of the many species of parasites that infest poultry, and which may be exterminated by proper care. Among the varieties of parasites that breeders have found excessively troublesome, none have proved more difficult to destroy or get rid of, when once they obtain possession of the fowl premises or get a hold on their bodies, than the small *red* louse (or "red spider," as some call it, being not unlike the green-house *aphis*), which infests many localities. This kind of vermin is not generally common, but they are very annoying, and destructive as well, if they are suffered to accumulate.

Sulphur alone dusted upon fowls will not destroy this "red spider." But a thorough fumigation of the house they infest, by closing the building tightly and burning a few pounds of resin and sulphur together inside, will "clean them out." Carbolic powder rubbed through the fowls' feathers, and the washing of your roosts with kerosene two or three times will finish them effectually, if this be faithfully done. In the dust-boxes, where the fowls enjoy their daily roll, place finely sifted leached ashes, and a pound or two of the powdered sulphur mixed. Fumigate your houses twice or thrice in a season, by burning a pot of crude brimstone and rosin inside (when the fowls are absent, and it is tightly closed up), and whatever

else you may be troubled with, fowl *vermin* will not annoy you, your poultry, or your premises—when once you are rid of this nuisance; which, as we have intimated, is the most trying, destructive, and pernicious secret scourge that afflicts domesticated fowl flesh.

Roup and its Phases. — This common fowl malady, which is designated by various different hard names, as we have indicated — embraces the ills usually denominated by the superficial observer as sore head, inflamed eyes, diphtheria, pustulated nostrils, a cold, hoarseness, heavy breathing, foul throat, snuffles, drowsiness, canker, blindness, drooping, cramps, fever, or general debility, etc. It is so complicated in its character, and outwardly so varied in different cases, it is not surprising that so many different titles should obtain for its numerous phases;—but all is *roup*.

It is brought on and confirmed by keeping fowls in damp, cold, sunless quarters. From their exposure to wet, chilling weather, and drafts of harsh winds. It results through neglect of the birds' ordinary comfort, and by their eating poor food. It will be caused by obliging your stock to drink foul, stale water, or by serving them with "damaged" grain. It will attack the flocks that are compelled to live and roost in badly ventilated hen-houses. Filthy floors, covered by or impregnated with their accumulated excrements, will thus sicken them. In these poor conditions, *vermin* will assail the weakened birds without mercy, and this adds to the evil and augments the roup amongst them, inevitably.

A roupy fowl may be known from any of the symptoms or indications first above noted. This disease is insidious — as well as multiform in the outward tokens of its approach, or its presence. It breaks out suddenly, often, and attacks several birds, apparently, at about the same time. The victims will droop, appear indolent, gapey, listless, and uncomfortable. The heads swell, the nostrils fill up, the comb and wattles turn pale, they breathe heavily, sulk around in the corners of the coop or run, snip, and sneeze, grow blind from swollen pustules gathering in and around the cheeks and eyes, lose their appetites, and finally fall away and die.

The earliest certain signs of this disease among the flock are usually discovered by the inordinate listlessness of the victims, and their moping about sluggishly. Loss of appetite is also an early token of this illness. The comb of the hens whitens — or sometimes turns dark colored. The breathing grows stifled, and the breath becomes foul. The eyes are first watery, and then fill (often to blinding), with acrid mucous matter. Pustules form around the upper portion of the beak, in the gullet, and around the eyes. The head is inflamed. They gape, and gasp, "rattle in the throat," become ruffled in plumage, and decline to mount the roosts at evening.

Roup generally comes on gradually. But it often occurs suddenly — from contraction of a severe cold, in wet, bad seasons. Fever ensues, the eyes close up with the swelling of the cheek glands, and thus the poor bird cannot see to eat — if inclined — which generally it is not, in this state. They suffer greatly from thirst, evidently, in the meantime.

The crop is generally found more or less distended, and the sufferer appears in pain, constantly. The nostrils are soon closed with the swelling and accumulating pus also, and they breathe with marked difficulty. So long as they can see, the affected birds will drink, incessantly. The forming pustules exude a froth, at times. This falls from the sores into the water-vessels, and the well fowls drink from the same fountain. This sickens others; and the contagion quickly spreads through the flock — if the afflicted bird or birds be not in time removed from amongst their companions.

Common powder of sulphur (as well as pulverized charcoal), is an admirable ingredient to mix in small quantities with soft fowl feed. Say a teaspoonful in the mash for a dozen adult birds, in one daily feed for three days at a time. This operates as a laxative, and the sulphur works outward through the skin-pores — thus assisting to keep the birds' bodies free from vermin to a certain extent. Raw onions cut up fine, as an occasional "green food,"

act similarly upon the system; and are highly beneficial for the purposes above noted. Fine sulphur, powdered charcoal, and chopped onions — when given discreetly — will each and all be found very serviceable to adult birds, especially when inclined to be roupy — as correctives, laxatives, and purifiers of the crop and stomach, in cold or hot weather.

Roup attacks fowls of all ages, but generally the younger birds and chickens are not so liable to it. It is both chronic and acute, and its contaminating influence is remarkable, where prompt remedies are neglected. Whole yards have been decimated by it, in a few weeks, where the sick birds were left to run *ad libitum* with the healthy fowls. And this result has been denominated in certain quarters, undoubtedly, by uninformed persons, "an attack of Chicken *Cholera*" upon their premises. Roup, therefore, like the mischief occasioned by lice, is but little comprehended. None but experienced poultry men recognize this baleful disease in its true light, and *they* learn about all its wretched characteristics and difficulties only by slow degrees, and after many losses, as well. Its ramifications are extensive, and its phases are both curious and threatening; if the disease gets a fair foothold in one's runs.

Catarrh is roup. We are well aware that enlightened Doctors of medicine assert that these two are different diseases. But we are writing about the ails of gallinaceous poultry, and not about those of human beings. Men and women are not afflicted with *roup*, thank Heaven! but they live a great many years, and suffer with catarrh; while in poultry the symptoms of both are identical. And so, as far as our careful observation goes, we have found that what medical men declare to be "catarrh" in fowls, is simply and clearly a phase of roup.

The cure for roup is, at the earliest moment after any of the first symptoms described are discovered, to take the affected fowl away from his or her mates, and nurse it, if it is to be "doctored" at all, at a distance from the others. Let such sick birds have clean, dry, warm quarters, and if not too far advanced, the head and nostrils may be thoroughly washed with Castile soap-suds, and then with weak alum-water, or a solution of chlorate of potash, thrice a day. After a day or two, bathe the head and nostrils in whisky, or diluted spirits of camphor — and give a little Cayenne pepper in warm cooked mash, for food. A couple of mustard or pulverized ginger pills, the size of small marbles, in each warm feed, are very good. As soon as the bird can see to drink, give him Cayenne pepper in the water. All these are warming, corrective, and good tonics. A most excellent mixture for a daily injection into the throat and nostrils, is a solution of sal-soda and another of chlorinated lime, half and half, put into four parts of water. This will remove the morbid deposits around the head and beak, and cleanse the disordered parts.

Dr. John C. Bennett used to advise the administering of pulverized charcoal, powdered sulphur, and new yeast, — three equal parts, in a flour pill the size of a hazel-nut, three times a day, for a roupy fowl, — accompanied by the bathing as above. But what the fowl most needs is cleanliness, warmth, and dry quarters for a few days. If the case is not severe, he will recover. If it is a very bad one — knock the bird on the head and bury it. If you have several cases at one time, before you take them in hand — take away the healthy birds promptly, and apply the above remedies to the rest. And if they are worth saving, you will be able with care to restore them, after a week's attentive nursing, bathing, and feeding. To avoid the presence or assaults of roup in your fowl-flocks, we recommend a better "remedy" against this ugly disease than the cures proposed. This is *prevention.*

There is no need whatever that a breeder should be greatly troubled with any of the phases of roup. Watchfulness on the part of the keeper for its probable appearance in bad weather, and *immediate* action, as soon as the first symptoms appear in any one individual bird, will stave off this disease at any time; and it cannot thus become serious. But best of all, is so to provide for your stock that they shall have good warm shelter, in cold and stormy weather — that they may not be huddled together in masses, to poison each other with the

foul emanations from their bodies, by day or by night — that they may have sweet, fresh water daily to drink — that their food be cleanly and nutritious; and above all, and over all, that they be not exposed to the depredations of devouring and enervating lice. And thus you will have little or no *roup* among them, of a dangerous or unmanageable character.

If left to forage for themselves in wet or foul yards and malarious grounds, if exposed to cold draughts in the house, and raw winds outside, if suffered to waddle and wade in barnyard filth, and drink stale, putrid water, if compelled to eat foul food, and but little of it — they will not only get lousy but roupy, as well; and you will find that fowl-keeping in this loose, improper, inhuman style "don't pay," and it ought not to be remunerative, under such conditions and such reckless usage. But, as we have observed, this "roup" disease is in its indications and operations both manifold and complicated. And hence the various kinds of names that different inexperienced persons give to it. Yet it is wholly peculiar to *domesticated* fowls, alone.

Therefore the *cause* of the malady must be looked for in the conditions which surround the tamed feathered race; inasmuch as no authority has reported an instance where a wild turkey, grouse, or prairie hen—a partridge, pheasant, or quail—a woodcock, snipe, or teal—a wild goose, duck, or other sea-fowl—snared or shot, ever yet was found in its native, free condition exhibiting *any* token of this roup about their bodies, externally or internally.

And since this affliction so often falls to the lot of the dumb creatures we attempt to keep around us for profit (or that they may conduce to our pleasure, convenience, or partial sustenance), it is but dutiful that we use proper care, if we keep them at all, that our poultry be so attended and provided for, that the pernicious *causes which produce this trouble* may not be permitted to exist about our farms and poultry premises; when, in such large measure, the evil may so readily be kept at a distance.

By the observance of the suggestions we have made, this curse of the poultry-house may be avoided. In no other way can roup, in some or all of its obnoxious phases, be kept from infecting your fowl-stock. And however easy it may be to the skilled breeder to cure this disorder, when he finds it unfortunately breaking out among his flock, the labor of averting the cause of its attacks is far less than the trouble it occasions to eradicate the nuisance, after it fairly shows itself on the premises. For this good reason we advise the humane and economically disposed fancier to look well to the possible *prevention* of roup in his fowl-houses, rather than to the best way to remedy the evil, which, with due care, he may rarely or never be annoyed with.

Accidental Maladies.—These include many of the nominal "diseases" of fowls—as set down in the categories of the poultry books, to wit.: Apoplexy, heart disease, rheumatism, neuralgia, deformities, frozen combs and feet, feather-eating, egg-devouring, wounds from fighting, temporary blindness, loss of plumage, colds, common fevers, paralysis of limbs, the "pip," "gapes," costiveness, discolored comb, bumble-foot, scaly legs, etc.

The above enumerated ills are more or less common in a mild form among domestic gallinaceous fowls at all seasons of the year. But these evils are incidental, or accidental in great part, to poultry life. Some of these affections are not discoverable by, or explicable to, the novice or amateur; and it is only the experienced breeder who detects the real character of some others of these difficulties, bad habits, misfortunes, or accidents.

Acute rheumatics, sprains, neuralgia, paralysis of the legs, colds, coughs, and occasional temporary loss of vision (by the closing up of one or both eyes) are simply *local* diseases, brought about by local and removable causes. With any of these troubles, fowls are usually not sick a great while at a time. Lameness, or "breaking down" in the legs from apparent partial paralysis is the most serious of all these accidental difficulties. If this proceeds from an affection of the spinal cord (as is sometimes the case) it is incurable; though a fowl may live for weeks or months after the attack—helpless as to locomotion comparatively, but other-

wise in good health. Neuralgic affections are similar to the rheumatic, and these are terms used synonymously among technical poultry men. The nerves rather than the limbs are affected by this disease. It is not a common complaint, however, and little is known of, or about it.

Deformities—such as hump-back, knock-knees, wry-tail, imperfect comb or wattles (of their kind) twisted wing-joints or turned wing-coverts, crooked toes or feet, etc., are generally hereditary incidents in poultry breeding. Sometimes these defects come from careless mating, sitting on perches that are higher at one end than the other, or through breeding in-and-in too long; that is, from the same family of stock upon its descendants, or with its progenitors. The only remedy for these "accidents" is to avoid the use of such deformed birds for purposes of reproduction of the species. A boiled or roasted cock is not likely to transmit his imperfections to posterity,—if this is the only (and best) use that can be made of his carcass.

Eggs are sometimes, when ready to be laid, accidentally broken in the abdomen of hens. If the fowl be strong, and in good condition at such a time, the disaster may be repaired. A teaspoonful of castor-oil, by injection, will work the wreck away in a single night. But this misfortune frequently proves fatal nevertheless. Other hens, especially fat old Cochins and Brahmas, will "break down behind" occasionally from this same cause, or on account of their gross adipose condition, oftenest. They will then waddle about upon their haunches and stern, with their bodies erect, like that of a Penguin, naturally. But they rarely recover from this condition to be useful afterwards.

Frozen combs, feet, or frosted wattles, and white or black comb (so designated from its different colors at times) are, as a general thing, occasioned by exposure in the night to severe chilly winter air. With the class of birds wearing thin upright high combs, this trouble is common in New England and the North, in our sharp cold winters. In these instances of "frost-bites" the wound may be cured by placing the comb or wattles in cold water, or by bathing the affected parts thoroughly, first with fresh clean snow, then by washing thoroughly in camphorated spirit. After this, bathe in sweet oil, and press the latter into the pores of the comb or gills, over and around the frost-marks. Except in very severe cases, this treatment will effect a cure. In any instance, the saving of a goodly portion of the comb and wattles may be assured. This remedy should be repeated two or three days, successively, for frost-bites.

Feather-eating and egg-eating by fowls are bad *habits*, but are not a "disease." For the first complaint the birds should be kept *occupied*, when cooped in confinement and compelled to huddle together closely, for lack of spacious home quarters. Strew the house-floor thickly with dry leaves, or short-cut straw; and into this scatter their daily allowance of dry grain-food—oats, barley, broken corn, etc. They will scratch for it to the last kernel; and thus have no leisure to pluck the feathers from the necks and sides of their otherwise listless companions. To prevent egg-eating, give them *dark* nests to lay in, in secluded corners or passages, where they cannot *see* their eggs, when dropped. They will soon forget this destructive kind of trick.

Wounds occasioned by frost, from fighting, or other accidental causes, may be healed up speedily with a wash of carbolic, or castile soap-suds, and then with rum or whisky, alternately, for a few days. Olive oil as a final ointment for cuts and flesh contusions, is very healing and effective, and for ordinary inflamed eyes and head, a wash of weak white vitriol, or alum water, or alum and camphor combined, is excellent. "Bumble-foot," tumors upon the thighs, abscesses, and unnatural enlargement of the tendons or limb-muscles, are all local and accidental difficulties. Bumble-foot is caused by bruising the sole; and occurs with heavy fowls that roost too high up, and come clumsily to the hard floor or earth, in descending from their perches. It may be dissipated, if discovered in season, by active friction and

rubbing with strong liniment. If not, it will grow to an abscess which must be opened to the core, and healed up thoroughly afterwards, to save the fowl. But this occasional affliction is hardly worth the trouble it costs to cure it; and it can only be remedied so as to restore the afflicted bird to subsequent usefulness by seasonable treatment.

Rupture of the oviduct, or egg-passage, and enlargement of the lower intestines, either of which causes old fat hens of the heavier varieties to "break down behind" frequently, is a difficulty known in the experience of most poultry breeders. As we have elsewhere hinted, this is a vexatious affliction, where the hen is a good one, or a favorite; and it is hard to manage it successfully toward restoration. The difficulty may be alleviated, but it can scarcely be cured; since the occasion of the bagging down of the abdominal extremity of the bird is a gradual falling of the over-grown and over-fattened interior, which from its excessive weight and enlargement distends the parts outside of the *cloaca*, unnaturally; from which distention it rarely, if ever, contracts to its original shape again. The remedy for relief in this case, is to place the fowl at once upon extreme low diet; and first to starve off and reduce the excessive overgrowth of internal fat which has filled up the lower abdomen. After a few weeks the hen will resume her wonted uprightness in gait and appearance, and may come round all right again.

If the cause of her breaking down is *not* this kind of internal rupture, but proceeds from the accidental breaking of an egg, inwardly—as is often the case—though the outward indications may be similar, the treatment for this last-mentioned trouble is alluded to in another place. The two difficulties are quite different, in reality, and require altogether different management. We often see fowls, particularly half-grown birds, that sluggishly mope about, seek the sun's rays, close their eyes dreamily and half open the bill, at every breath they breathe. Otherwise they seem well, and in fair condition. Look to the birds directly, that exhibit these symptoms. If concealed *vermin* be not at work upon their skin and flesh—these indications are tokens of an approaching attack of roup.

Remove such bird or birds at once from the rest. Give the mustard, ginger, or rhubarb pills, for a day or two. Allow them for three or four days to drink no water that has not a dash of tincture of iron, or cayenne pepper in it. Feed low for a week, keep them dry and warm—and they will recover. "Scaly leg" is a disorder very unsightly, and afflicts old fowls, chiefly. The disease appears from the surface of the shanks, forms slowly, and is altogether parasitical. If permitted to mature, it grows into rough, greyish-white bunches, and terminates in sores. To cure it, commence early, and first wash the limbs thoroughly, in warm whale oil, or carbolic soap-suds. Then apply sulphur powder mixed with lard, as a salve, for two or three days. Afterwards cleanse, and finish with kerosene, rubbed on with a coarse flannel. The infinitesimal insects are thus destroyed, and the trouble disappears.

Moulting, or the annual feather-shedding of all birds, is described by some authors as a "disease." This is but a natural occurrence. Fowls are not "in condition" at this period, but they are not sick—in the true interpretation, at such times. They need better care, just then, nevertheless, since this is a critical transition; and good two or three-year old hens, kept for breeding stock, should be especially looked after, judiciously fed, kept away from the annoyance of the males, and they will generally pass through their moulting safely. These accidents or incidents occur in all poultry yards. But where fowls are properly tended, housed, and treated, far less of these complaints are heard, than upon the premises of the careless, indifferent, or reckless breeder. And it will be found by the humane, considerate, and kindly disposed keeper of this useful and interesting class of live stock, that a share of his attention given daily to the condition of his fowls, a watchfulness of their reasonable needs, and an eye open to the probable or possible *approach* of these troubles, will save him toil and money both, in his fowl-breeding experience.

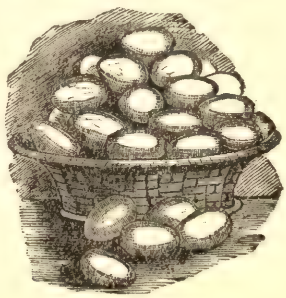
The large majority of the ailments of poultry referred to herein are directly traceable

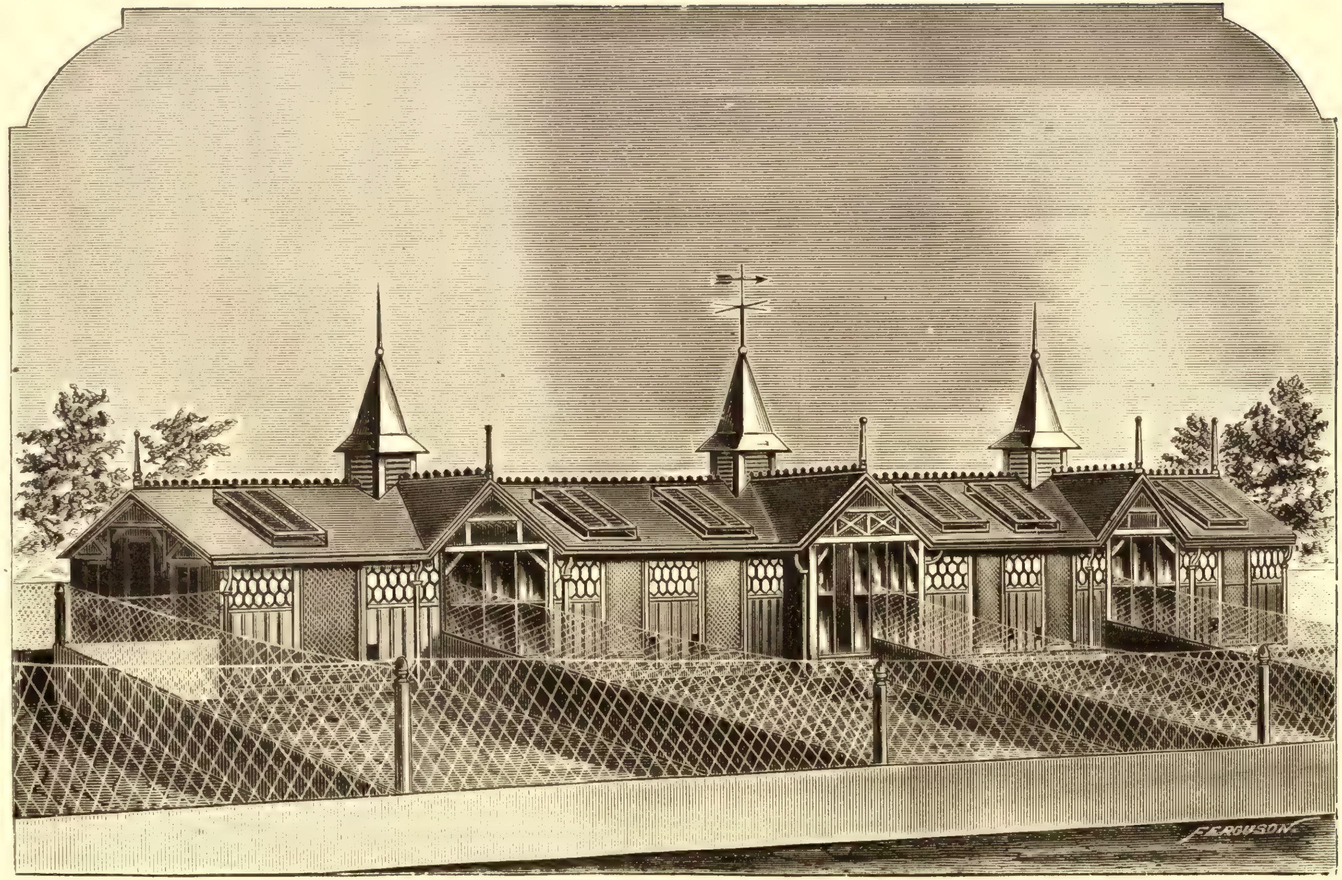
for their cause to the errors and short-comings, carelessness, and inhumanity of those who are responsible for the unprofitable and unfortunate results attending their ignorance and indifference. The different diseases herein noted embrace all the maladies that are habitual among domestic poultry. If any other occur in the experience of American fanciers or breeders of fowls, they are *exceptional*—not generally prevalent. And we apprehend that if such exceptional cases are known, they may be readily traced to a correspondence with some one of the leading "diseases" herein mentioned; the *cause* for which will also be found to be similar to those which we have endeavored briefly but clearly to explain.

There is one important recommendation in ministering to these fowl-ails, which we have always found so necessary to average success in treating the invalids, that we feel constrained to insist upon its observance, for the common benefit of poultrymen and the stock. And this is that fowls should never be over-dosed. The less medicine given them—as a rule—the better they will be off, in the end. They need but very little in quantity, at any time, to operate on them to their advantage, or their destruction. It is easier to kill a good bird with over-dosing, than to work its recovery by judicious physicking. And many of the mineral and powerful medicines proposed by those who have never studied a domestic fowl's actual construction and constitutional habits, are utterly useless as remedies for their little ailments. So we repeat that the simplest remedials are always the best.

What we understand the nature of, and what we know will work in a certain way, regularly and effectively—such as sulphur, castor-oil, powdered rhubarb, alum, sal-soda, alcohol, camphor, cayenne, tincture of iron, garlic, etc., when properly administered, are the sort of medicines which should be made use of—and *not* the numerous chemicals and minerals advised by those who do not appreciate a fowl's composition, or natural formation. In a department prepared like this, for a work so extensive and embracing so many subjects, the space allotted for the full treatment of the subject of diseases of poultry is necessarily limited. But the writer has given his views upon the *leading* ails that fowls are subject to, and many hints contained herein will be found valuable to both fanciers and growers of poultry. It must not be forgotten that filth, cold, and wet yards, poor shelter, improper food, tainted drink, starvation, neglect, sunless houses in winter, or lack of shade in summer, close confinement, lousy nests, dirty floors, foul feed troughs, want of ventilation, etc., etc., are the causes of fowl disease, and death among them.

Reform this, altogether, or do not attempt to breed poultry, is our advice. And if the suggestions made herein towards the performance of the higher and better part in fowl-keeping be followed—we are quite confident that poultry breeders will be troubled very little with "diseases" among their flocks. With the nicest care and the best arrangements, however, fowls in American poultry yards and runs will inevitably get sick, more or less—as they will elsewhere. During the past few years, it has been noticeable that more complaints were current than ever hitherto, of ails among fowls. And this fact induced the author to prepare these pages, in a concise and complete form—limiting the article exclusively to the subject of diseases of domestic poultry. As we stated in the opening of this subject, it is important that we know clearly *what the matter is with our fowls*—when out of trim—before we begin to dose them. This being satisfactorily determined, we can then go about assisting them to throw off the disorders, and do this intelligently.



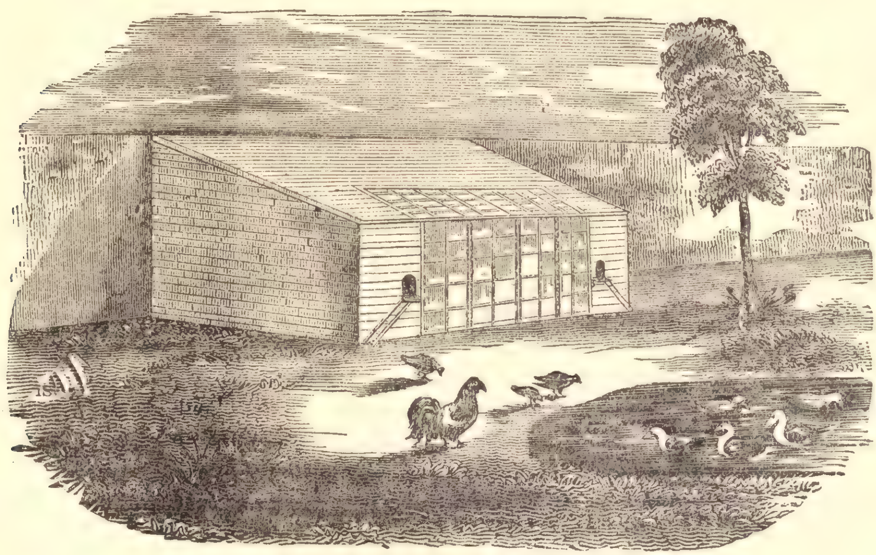


POULTRY HOUSE OF WM. GRAY, Jr., BOSTON, MASS.

POULTRY HOUSES.

IN order to attain success in poultry raising, a good substantial house will be necessary. It need not essentially be large or expensive, but should be warm and comfortable, and provided with ample means of ventilation and admitting the sunlight. It may be cheaply constructed of common boards, with the cracks well battened, and glazed sash of large size on the south side. Ventilation is best accomplished by having a cupola on the roof, under which may be a small door, or ventilator, opening down into the building. To this may be attached a cord so that the ventilator may be opened full or half-way, according to the weather and other conditions. Where the winters are very severe, it will be well to line the inside of the hen-house with tarred paper, or to lath and plaster it. The roosts should all be low, and on the same level, as fowls, like many of the human species in society, will be apt to quarrel for the highest perches. Large, heavy fowls should always have low perches, so that they can gain easy access to them. It is a good plan to have the roosts hinged to the side of the building, so that may be raised up out of the way when the house is cleaned out.

The different pens of the house should have a wire netting a part of the way above the board partition, to prevent the hens flying over. There should be feeding troughs placed against the wall of the house inside, and wired over to prevent the fowls from getting their feet into them. Feeding boxes that are self-feeding are very good for this purpose. It is also a good plan to have feeding troughs in the center of the yard, where the fowls may be



A CHEAP AND CONVENIENT FOWL HOUSE.

fed in warm, pleasant weather. These should be made stationary, so as not to be upset. Pure water should always be kept where the fowls can have access to it at all times.

Various kinds of water tanks and drinking fountains for fowls are recommended. Those so arranged that they cannot be easily upset, or the water made filthy by the fowls, are the best. A three or four-gallon jug filled with water and turned mouth down, in a suitable dish, and properly supported, makes a very good drinking fountain.

Mr. George C. Brown, an extensive poultry breeder in Maryland, recommends that the floor of the hennery be never made of wood, as the droppings are absorbed to a certain extent, which causes an unwholesome odor, as well as dampness, both of which are very detrimental to the successful rearing of poultry. He says: "The proper way is to build a tight wall (cement or plaster), at least one foot higher than the earth, and fill it up with good, dry sand or earth. Constructed in this manner, the floor being so much higher than the outside earth, it is always in all weathers entirely free from dampness. Nests must be provided, and they should be made as secluded as possible. Have them quite dark. The hens like to go in a dark place to lay, and they are not as apt to get in the bad habit of eating their eggs, if nests are thus constructed. Where the house is made large enough to admit of it, it is a good plan to have a narrow room adjoining, and have all the nests made uniform in size, with a *bottom*, *sides*, and *one end*. They can be arranged on shelves, near the bottom of the room, placing the upper end towards the roosting room, so that the fowls can enter the nests from there. A board should be so arranged in the little room and hinged, that it may be raised up to gather the eggs from these nests."

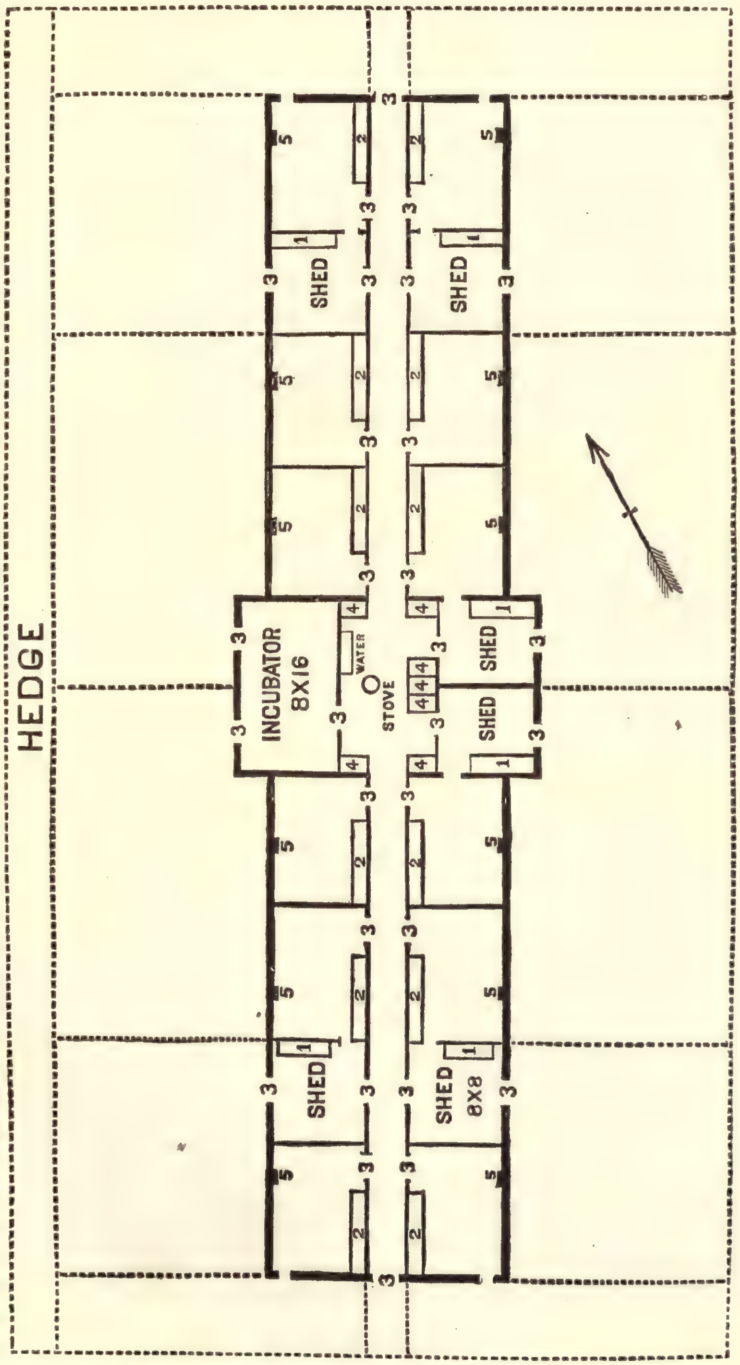
POULTRY HOUSE OF G. W. CHIDSEY, ELMIRA, N. Y.

The natural floor is, of course, the earth, but this is,—unless special pains be taken,—in almost any locality, too wet from the constantly rising moisture of the lower strata, and too foul from droppings, to furnish a wholesome dusting place, even if it were not too damp to be friable and dustlike. To obviate this, either a floor of sand, as above recommended, should be provided, or one of wood or cement. The latter is easily made and does not require the service of a mason, as many suppose. In any case, the floor of the hennery should be raised considerably above the level of the ground surrounding the fowl house. This is very important, otherwise the water after the rains and melting snows, will work its way in upon the floor, making it wet and causing bad odors, thus inviting roup and other diseases. If the building has no eave-trough and conductors, a ditch should be constructed around it to carry off the water.

Where boards are used for flooring in the poultry house, it should be thickly strewn with sand, ashes, road dust, saw dust, or other dry, absorbing material, which should be frequently cleaned off and renewed, in order to keep the surroundings as clean as possible. Always make ample provisions for an abundance of sunlight in the hennery; it will render the quarters much more healthful, and add much to the warmth in winter. Provide large dusting boxes, at all seasons, where the hens can have plenty of room to fill their feathers with dust. This will aid greatly in keeping parasites off; besides it is one of the methods by which the feathers are kept clean. Road dust, clean, dry soil, or ashes, are excellent for this purpose.

We give in this connection, cuts of several poultry houses, of different styles and sizes, adapted to the raising of a large or small number of fowls, from which many valuable hints and suggestions may be obtained by those desiring to construct a hennery.

The accompanying cut of Mr. Gray's poultry house is scarcely a fair representation of the fine building the owner has devoted to his feathered pets, and which he breeds solely for the pleasure and recreation he finds in their care. It is situated on an estate which occupies eleven acres in the limits of Boston, on Howard Avenue. In order to give a better view of the house, the artist, in sketching, omitted the fine shade trees that add much to the attractive appearance of the grounds. The house is built of stone, with a lawn sloping from it on all sides which renders the drainage perfect, while it stands so as to face a little south of south-east, and thus secures the sun on both sides and end of the building during the day. Under the gables are the sheds, or what can be made open sheds by opening the windows, which are seen and represented as being open in the cut; the windows in the laying room being here represented by wire netting. The building is 100 feet long and 20 feet wide, with a hall-way 3½ feet wide running the entire length, as will be seen by the accompanying ground plan. It is divided into twelve rooms and six sheds for fowls, besides an incubator room 8 by 16 feet, in which is an incubator of 360 eggs capacity, for hatching purposes.



GROUND PLAN OF MR. GRAY'S POULTRY HOUSE.

the interior finish we find hard pine floors, and hard wood for the studding or close partitions with plastered ceilings ; while gas is used for light and also for heating the incubator and

cooking the food for the chickens. Heavy wire netting is used for the upper panels of all the doors, with doors opening on the hall, which latter is a convenience in collecting eggs from the nest boxes, No. 2. No 4 represents the locality of the grain bins, where is a stove which is used to keep out dampness and render the temperature comfortable in cold weather; here is also a sink with water etc. No. 5 represent the location of ventilators 5 by 10 inches, covered with wire netting to exclude all unwelcome intruders in the form of rats, bats, etc., and which supply the building with pure air, while the foul air has means of escape through the

POULTRY HOUSE OF L. E. SINSABAUGH, SYRACUSE, NEBRASKA.

BIRD'S EYE VIEW OF MR. SINSABAUGH'S POULTRY YARD.

three cupola ventilators in the roof. The building is supplied with aqueduct water, which is kept constantly running by means of a faucet in each room over an iron basin in the shape of a quarter globe, which has an escape valve to prevent the water from overflowing, and

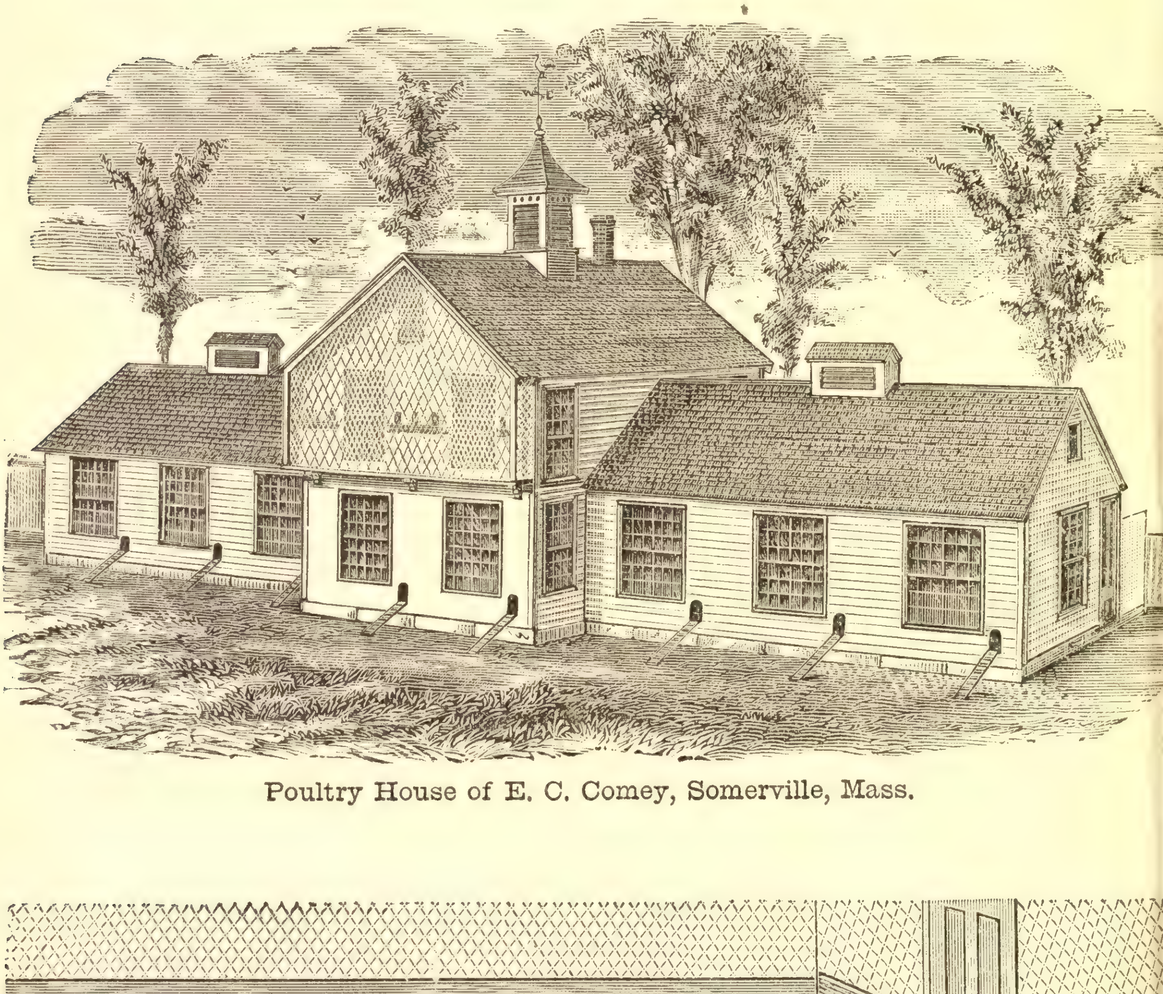
which furnishes the fowls with pure water constantly. No. 1 shows the locality of the several dust boxes where the fowls may take their dust bath *ad libitum.* The floors are kept covered with clean gravel to the depth of three inches, which adds much to the neatness, as well as the sanitary condition of the place. These pleasant quarters have for their favored tenants Light and Dark Brahmas, White, Black, and Partridge Cochins, ten occupying a single pen. We are indebted to the courtesy of the publishers of the *Poultry Monthly* for permission to copy the foregoing illustration.

Although such a building as this will doubtless be more expensive than the majority of our readers would wish to build, yet a description of its plan will furnish valuable hints that may be available in the construction of a cheaper or smaller house for poultry.

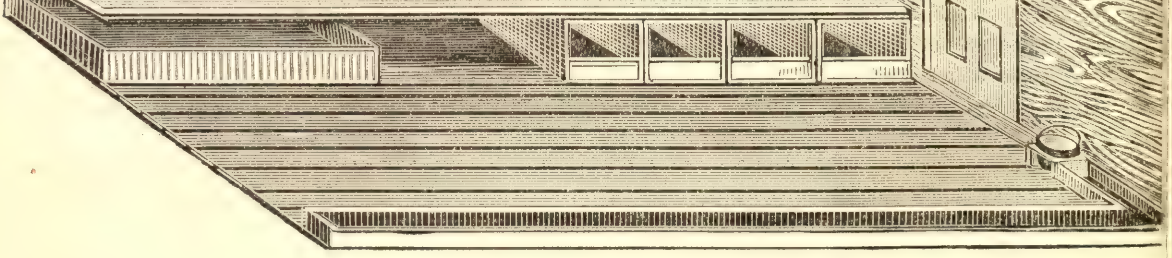
The preceding cut of Mr. Sinsabaugh's poultry house will doubtless prove interesting to both extensive poultry breeders and those keeping fowls in small numbers, as being very convenient and comfortable for the purpose. The building is one hundred and four feet long and sixteen feet wide; seventy-two feet of it being one and a half stories high. The upper portion or second floor is used for hatching purposes, and as a run for young chicks when the weather is too cold for them out of doors. The arrangement is such that each pen of fowls has a roosting room twelve feet square, a ground floor shed twelve feet square, besides two outside yards 24 by 60 feet, which are used alternately, the one being sown to oats which are growing while they are running in the other, thus keeping them supplied with green food. The sheds are valuable as furnishing a place for scratching in the dirt in winter, or as shade in the hot summer weather. A hall-way 3½ feet wide runs the entire length of the building, along the partition of which the nests are arranged in such a manner that they are entered from the rooms, each nest having a separate lid in the hall-way, so that the eggs can be gathered by passing along the hall, without entering the rooms.

Mr. Comey's poultry house, of which we give an illustration, is 64 feet in length. There are two one-story wings, each of which are 15 by 24 feet, the entire main floor being divided into eight pens, 8 by 15 feet each. The second floor is arranged for hatching purposes, the keeping of pigeons, &c., and is well ventilated from the cupola. From the second story there is a balcony 20 inches wide, from the edge of which a wire netting is attached in such a manner as to confine pigeons, and at the same time to provide them with an out-door run. The ground floor is well ventilated by adjustable ventilators on the ridge of the wings, and by a box in the center 20 inches square, extending to the cupola. An alley 3 feet wide runs through the building, which in the main part enlarges into a room 12 by 16 feet, in which is a stove for warming the building in damp or cold weather, grain chests, closets, stairway, etc. The partitions are 7 feet in height, including the four feet of wire netting at the top. Each pen has a perch located 8 inches above the center of a platform which is 28 inches wide and 16 inches above the floor, under which are movable nests and a dusting box. Both ends of the perches are supported by cast iron perch-cup holders, which are filled with kerosene, and by means of a wicking extending under the perch, from one cup to the other, the kerosene is drawn the entire length, and all the vermin are kept off. A feeding trough 3 by 4 inches, and 6 inches above the floor, runs the entire length of the pen on the side opposite the perch, which gives the fowls room to eat without crowding, while at the end of the pen there are boxes for ground shell, gravel, and a water-dish. Each pen has a window 4 by 5 feet facing the south, also a yard 8 by 66 feet, with a southern slope and containing shade trees. (There not being sufficient room in the cut for the representation of the yards, the artist omitted them.) The partitions between the yards are boarded solid from the ground to a height of 3 feet, above which a lattice work of 3½ feet extends. In visiting Mr. Comey's grounds we were particularly impressed, not only with the convenience with which his poultry house was arranged in all the minor details, but the gentleness with which he handled his fowls, and the entire absence of fear that they manifested toward him, he being able to pick any of

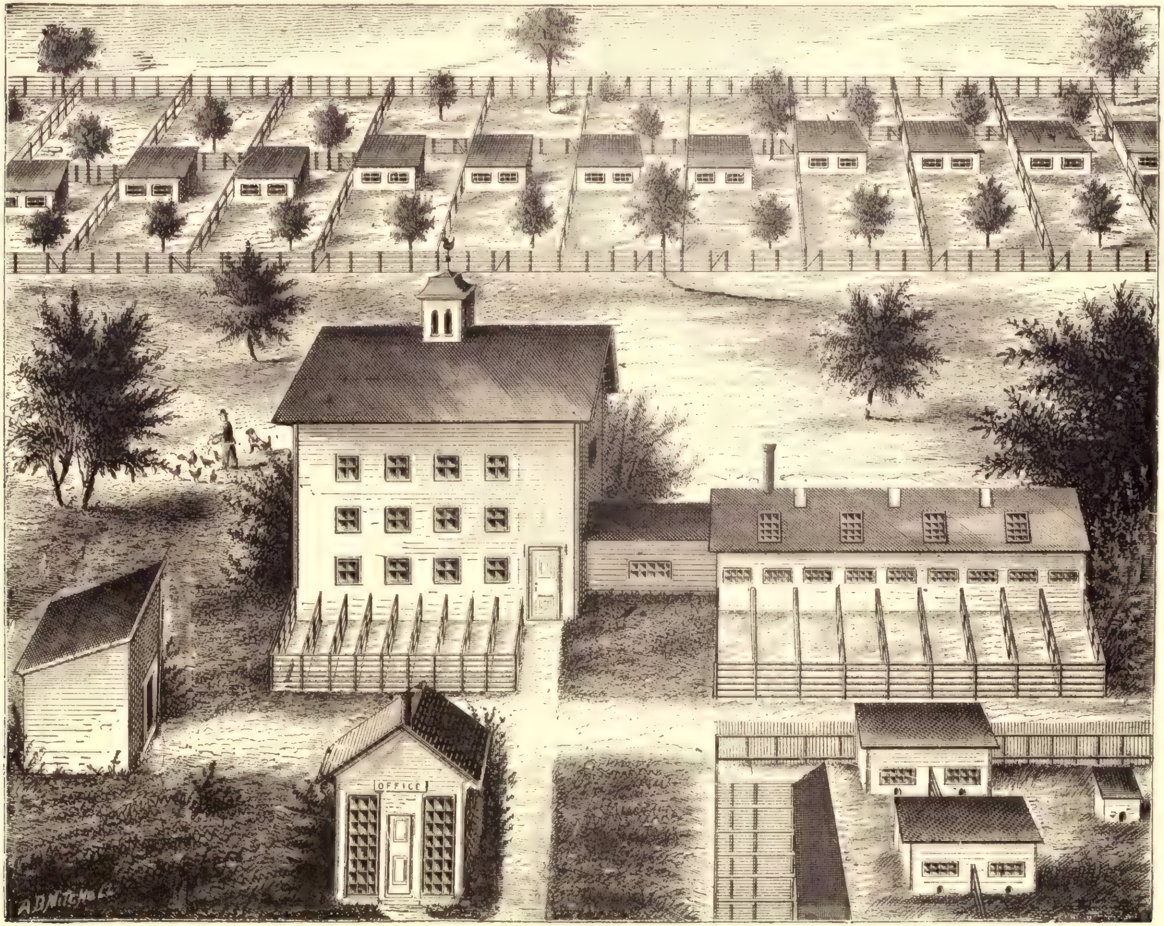
them up at any time as he chose, without the least resistance on their part. Fowls thus tame give unmistakable testimony of the gentle treatment they receive. Kindness towards animals and a love for them is a trait to be honored and admired, and a necessary accompaniment to the successful rearing of fowls, or any other of the domestic animals.



Poultry House of E. C. Comey, Somerville, Mass.

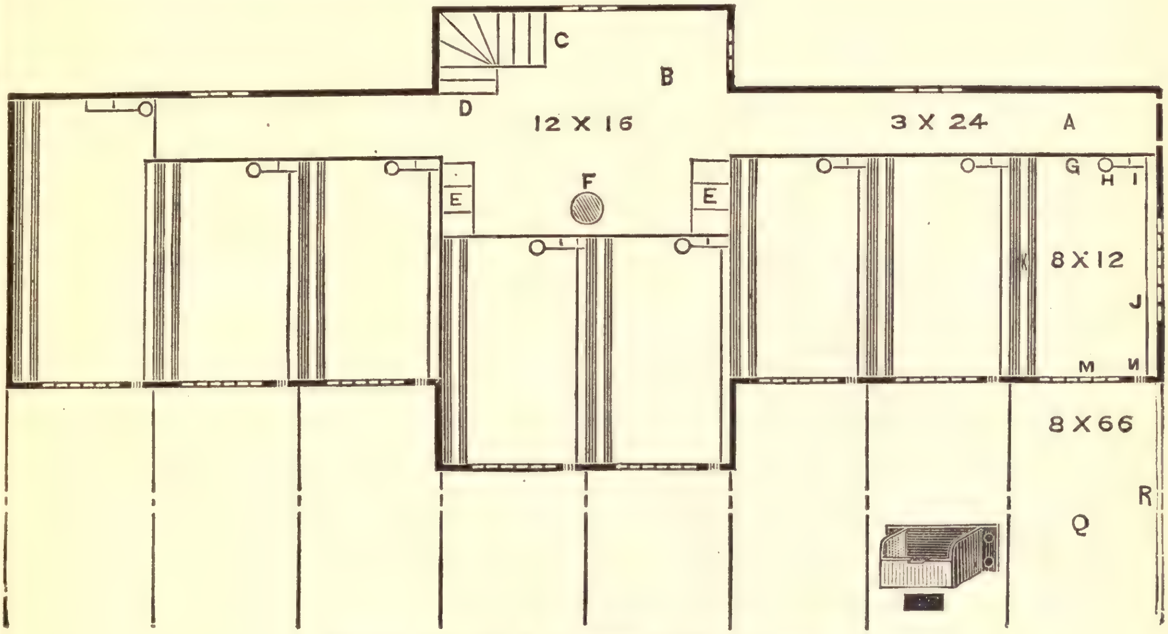


Interior View of one of the Poultry Pens.



POULTRY GROUNDS OF GEO. S. JOSSELYN, FREDONIA, N. Y.

The following will explain the diagram of the ground plan of this building: A, Alley; B, Room for receiving, storing, etc.; C, Closet under stair; D, Stairway; EE, Grain chests; F, Stove; G, Door leading from alley into pens; H, Water-dish; I, Oyster-shell and gravel-boxes; J, Feed-trough; K, Perch; L, Platform to catch droppings; M, Large window; N, Hole opening into yards; O, Dusting-box; PPPP, movable nest-boxes; Q, Outside yard; R, Gate; S, View of perch cup-holder.



GROUND PLAN OF E. C. COMEY'S POULTRY HOUSE.

The accompanying cut represents the poultry buildings and yards of Mr. George S. Josselyn, formerly an extensive breeder of fancy poultry of various kinds.

The buildings, which are numerous, are so designed as to keep each breed entirely separate, from each other, and provide all with large rooms. The main building is three stories high, and is connected with a smaller house of one story by a covered passage-way, which contains a bin for grain on each side, a well, and the heating apparatus. Both buildings are divided by a hall running the entire length, and sub-divided into pens on each side. A run for each pen is found in front of both houses, and the smaller houses seen in the background are equally well arranged.

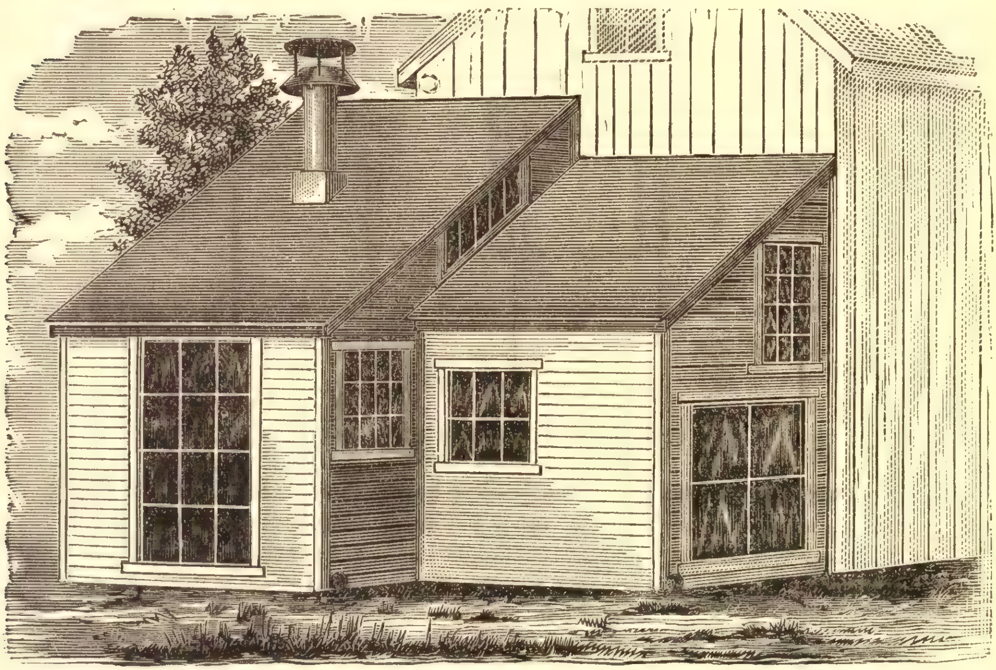
The poultry house of Mr. Chidsey is a neat and tasteful building with a gothic roof, as shown in the illustration. The center house is 14 feet by 16 feet, 8 foot posts. The wings are 14 feet by 16 feet, with 8 foot posts in front; roof descending to the back. The whole is divided into six compartments, and is admirably adapted for the rearing of different breeds of fowls, including a loft for a good collection of fancy pigeons.

The poultry buildings of Mr. Waugh represent a very convenient house adapted to a smaller number of fowls than those previously represented. The walls inside are of matched boards, tar paper being used also for the securing of additional warmth, while between the posts it is packed with saw dust. It is well ventilated at the top, the ventilator being in the center of the large building, and has an opening of 16 by 16 inches. The windows are double, to secure warmth in winter, and can be swung open or taken out in summer, and screen windows put in their places.

In the sleeping-rooms are tight board shutters, which can be closed in cold weather. The second floor is designed for setting hens and young chickens.

Warmth in Poultry Houses.—Warm poultry houses are very essential in winter, especially in a cold climate. The temperature will be largely modified by having an abundance of sunlight, which can be obtained with a southern exposure, and large windows on the south and east sides of the building. Additional warmth may be obtained by the use of double windows. A stove of some kind is a cheap and economic means of warming a poultry house. The temperature will be kept comfortable, and the place dry by this means. A coal stove is very good for this purpose, as it requires so little attention and keeps burning through the night. An oil stove is also very convenient for this purpose.

A recent writer gives his method of warming his poultry hen-house as follows: "Oil stoves offer a means of warming a house, which is both convenient and safe. If a trench be dug through the middle of the floor of the house, and a brick flue laid under the floor,



FRANK WAUGH'S POULTRY HOUSE, LOWELL, MASS.

connecting a shallow pit at one end, with a piece of stove pipe two to four feet high at the other—all inside the house—an oil stove having eight inches of wick for every 500 cubic feet of air, will temper the air of the house, so that in this latitude water will never freeze, provided the walls are reasonably tight. The shallow pit laid with bricks and cement, should be covered with a smooth flagging stone, and this with a board in case the stove gets very hot. The edge of the pit must be framed to protect it, and at one side of the stove a brick or two must be left out for air. This arrangement will warm the earth floor over a space a yard wide, and besides the warm air will issue freely from the pipe. Care is needed not to have the wick so low that imperfect combustion takes place, giving off bad odors. This plan of placing the oil stove under ground, is much better than having it exposed.

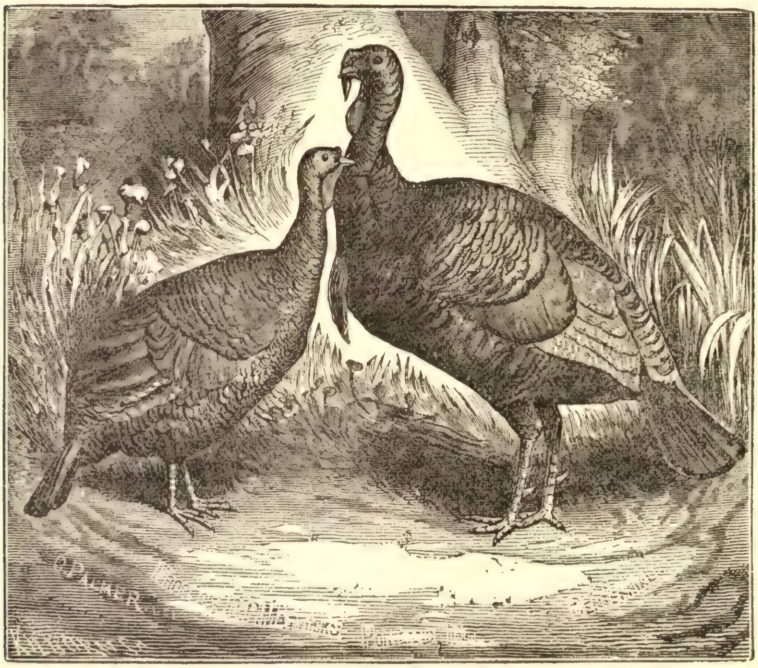
The whole expense of this way of warming is very little: if the stove be lit at 9 to 10 o'clock, it will be necessary only to burn it until sunrise, and a quart or so of kerosene will be all that need be consumed each twenty-four hours for warming a small house. It is desirable

that the temperature of a poultry house should never fall much below freezing. A warm house breeds vermin even in winter. The preventive and remedy for all kinds of lice upon fowls is dust. Into a little ashes, dry-slaked lime, and now and then a handful of flour of sulphur, may occasionally be thrown into the dusting box, and if the dust is kept clean and dry, and is fine enough, the whole house, roosts, nests, and all will be covered with it. Double glazing of the windows, or green-house sashes used in poultry houses, are a great advantage; and by this, a disagreeable dripping is prevented in cold weather."

A warm poultry house, combined with good food and suitable management, will be sure to result in a liberal supply of eggs during the winter. Besides, if the poultry house is not kept sufficiently warm, there will be a liability of the fowls having frozen combs, especially the single-combed fowls, such as the Cochins. We knew an old lady who had a very original device for preventing frost-bitten combs, and who kept thirty Leghorns, but whose hen-house was somewhat dilapidated and cold. Not wishing to have her pets disfigured with frozen combs, she made a flannel night-cap for each one, and regularly every cold night she visited the hen-house after the fowls had gone to roost, and put them on. It was a most comical sight to see these hens all in a row on the roost adorned with red flannel night-caps. Before the next winter, however, she had the hen house repaired, as the night-cap institution proved too troublesome to render its continuance profitable.

TURKEYS.

THE domestic turkey is a descendant of the wild turkey of North America, or of a species of this race found in Mexico, and which differs from the former only by white being mixed with the tail coverts and tail. It is more than three hundred and fifty years since the turkey has been domesticated, yet, notwithstanding, it still retains many of its wild habits, even under the most favorable conditions for counteracting them. North and South America are the habitats of a separate species of this bird; and while that of the latter, also known as the Ocellated Turkey, has been domesticated to but a limited extent, the North American species has greatly increased and multiplied, having been domesticated and bred in all parts of the civilized world. All turkeys, whether of the wild or domestic varieties, breed freely one with the other, and continue prolific, thus proving conclusively that they were originally derived from the same species. The first writer who mentions the American Turkey is supposed to be Oviedo, who, in 1525, describes them under the name of peacocks, and comments upon the vast numbers found in this country at that time, their excellence as an article of food, etc.



BRONZE TURKEYS.
Bred by Gen. C. P. Mattocks, Portland, Me.

Lopez de Gomara published a book in 1553, in which he describes the wild turkey of America, calling them *Gallapavo*, and speaks of their flesh as being delicious. Pedro de Ciesa found them upon the Isthmus of Darien, Dampier in Yucatan, while Buffon and other later travelers mentioned them as seen in various portions of this continent. When the Spaniards conquered Mexico, they found the turkey in a domesticated state, and it is supposed to have been domesticated for several centuries before that period. This bird was introduced into England from America in 1524. It is supposed that they were introduced into France about that time, and into Germany from France about the year 1530.

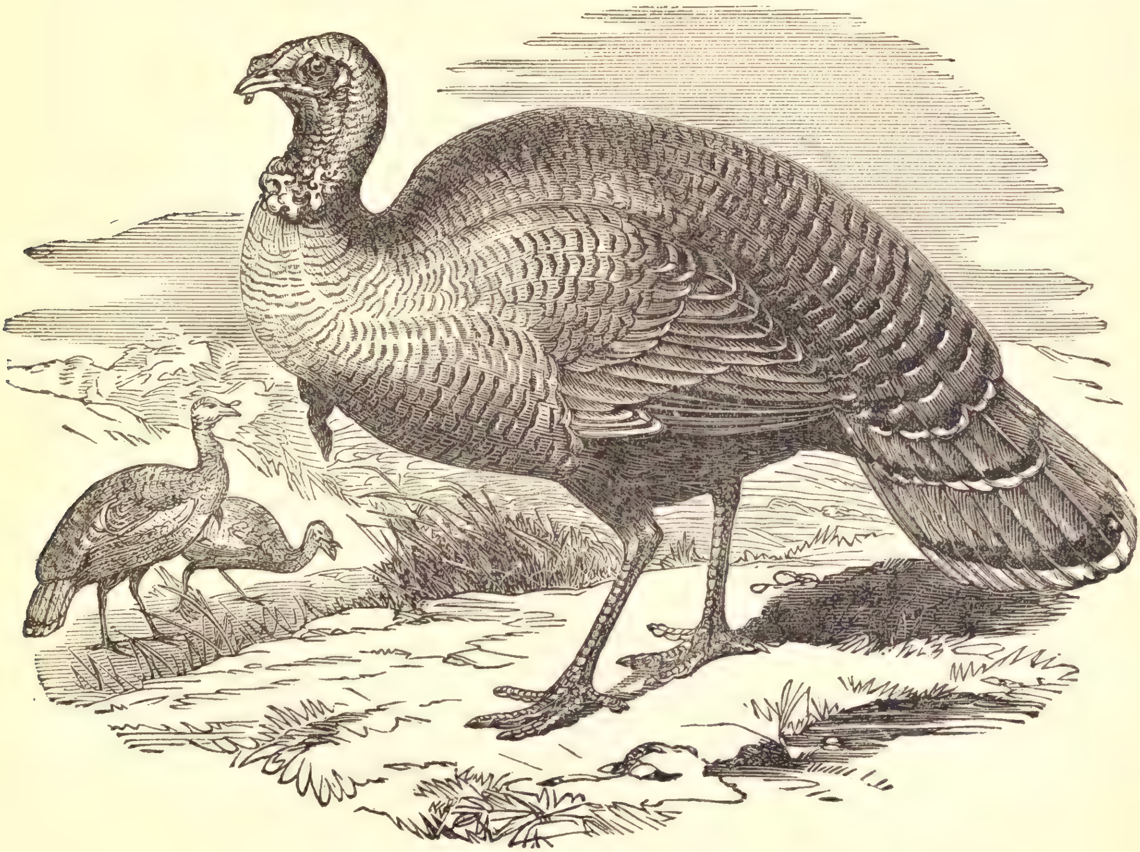
In describing the native wild turkey Audubon says: "The grand size and beauty of this fowl, and its value as a delicate and justly prized article of food, render this the most interesting of the birds of the United States. The flesh is more delicate than that of the domestic turkey, and the Western Indians so value it, that they call it the white man's dish."

The plumage of the North American Turkey is very brilliant, of a metallic bronze hue, with a blending of colors such as black, green, bay, and brown. Like all of the feathered

WILD TURKEY.
Bred by W. K. Laughlin, Fort Dodge, Iowa.

tribe, the cock is much more showy in plumage than the female. The Ocellated or South American wild Turkey is also very brilliant in plumage. The original wild species were black, bronze, and white mottled; but we now have them of any color, being bronze, black, buff, slate, white, etc.

The Bronze Turkey.—This variety of turkey has never yet had a rival, and probably never will have, with those who raise these birds for market, on account of their large size and hardiness. They are the largest and without doubt the best of the domestic varieties. The bronze variety was produced by a cross of the wild turkey upon the common turkey hen, the produce being improved by careful selection and breeding. The ground



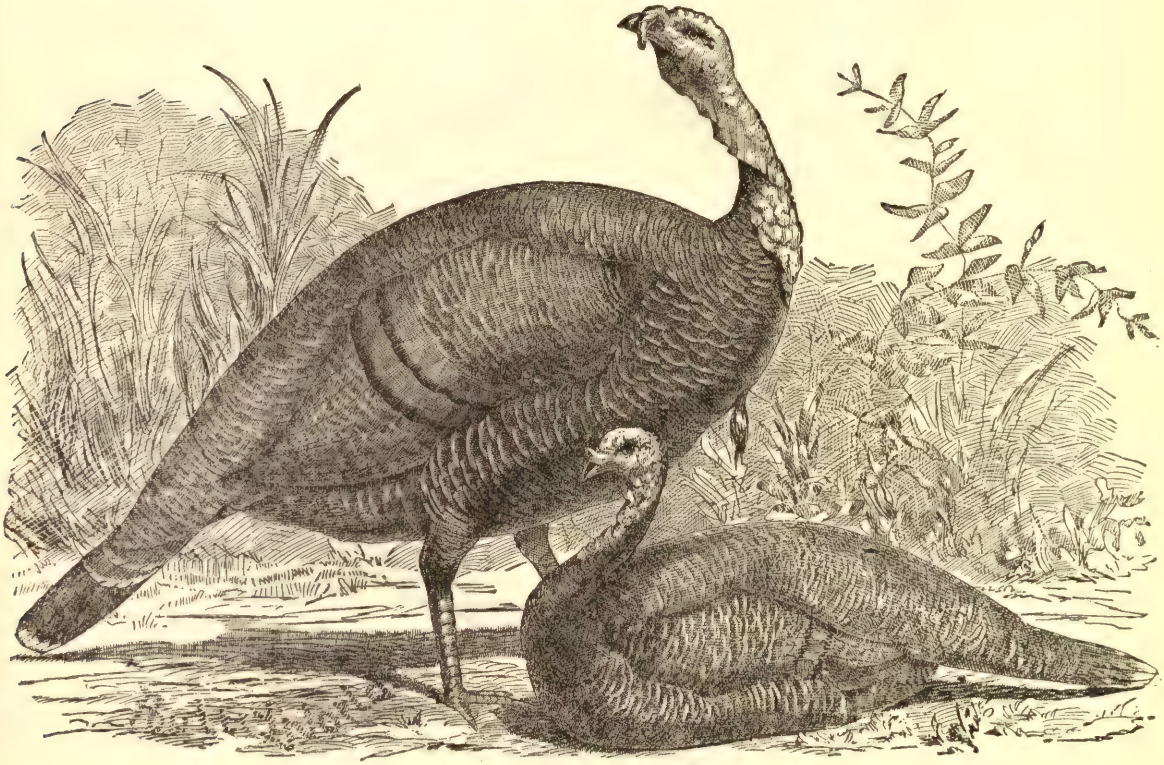
THE MAMMOTH BRONZE TURKEY.

color of this variety is mostly black, being variagated upon the wings and tail with brown, white, and gray, while nearly the entire plumage shows reflections in a bright light, of the most brilliant bronze, with rich and changeable colors.

The best specimens of this variety are described as follows: In the cock, the head, face, jaws, and wattles, are a rich red; the head long, broad, and carunculated; beak strong, curved, of a light-brown color at the tip, and dark at the base; eyes dark hazel, bright and clear. The neck, breast, and back, of a brilliant bronze hue, which glistens in the sunlight with a golden tint, each feather terminating in a narrow band, which extends across the end. The plumage of the under part of the body is similar, but somewhat less brilliant. The body should be long, deep through the center, and well rounded; the hind part well supplied with soft fluff.

The wings are large and powerful, the primaries black or dark brown, penciled evenly with bars of white or gray, secondaries smaller; wing bones black, showing a brilliant bronzy or greenish reflection in the sunlight; the wing coverts are a beautiful rich bronze, each feather terminating in a wide black band, giving a wide bronze band across the wings when folded; tail black, each feather being irregularly penciled with a narrow brown band, and ending with a broad black band, with an edge of dull white or gray. The more distinct the colors throughout the whole plumage, the better. The legs are long, and strong, and dark or nearly black in young birds, changing to a lighter color in older ones.

The hen turkey is somewhat less brilliant in plumage than the cock, but is really a beautifully plumaged bird. The skill and experience of our best breeders have been tested in bringing the bronze turkey to a very high state of perfection, and the thoroughbred bird of

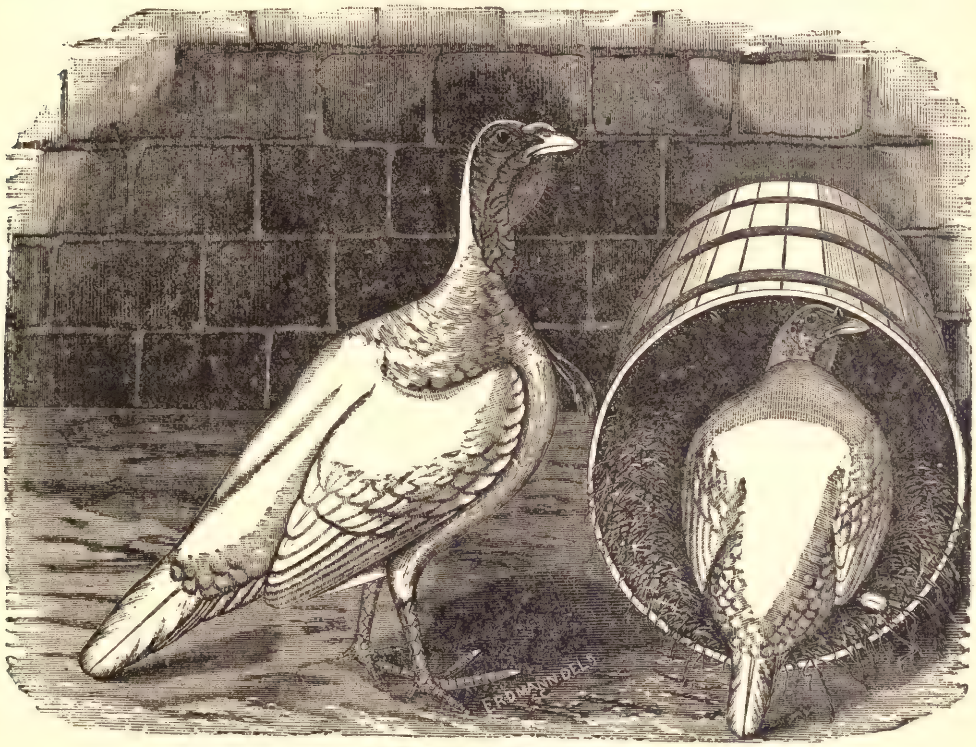


NARRAGANSETT TURKEYS.

this variety posesses certain fixed characteristics and qualities which will be reproduced in their offspring. The average weight of the adult bronze turkey cock is from thirty to forty pounds, when well fattened,—the hens from twenty to twenty-five pounds when fully matured. Young gobblers at eight months will frequently weigh from twenty-three to twenty-five pounds, and young hens from fourteen to eighteen pounds. These are about the average weights, although they are frequently exceeded in adult well fattened birds. They are good layers, and very hardy.

The Narragansett Turkey.—This is a variety very common in New England, especially in Connecticut, Rhode Island, and Massachusetts, where they have been bred for many years. Says a recent writer: "The Narragansett is an old acquaintance, and a very superior bird. He is one of our largest kinds, and is a very hardy fowl—raised to the

greatest perfection, perhaps, in the southerly portion of New England — which has long been specially known as a region where fine turkeys are produced. In the lower counties of Rhode Island and Connecticut — along the borders of the sea — enormous numbers of turkeys are raised annually, for the Atlantic city markets, or for family consumption in the large inland towns of New England, New York State, etc. And chief among this production has been the Narragansett Turkey — in later years improved upon by the introduction there of the Mammoth Bronze gobbler, which has increased the average size largely. The colors of the plumage of the Narragansett Turkey are black and white, mixed or splashed, so that they pass for a gray bird. But the feathering is uneven in hue, though it is claimed by those who have bred them extensively that, with proper selections and mating, they could with care be bred to a feather in color."



WHITE HOLLAND TURKEY,
Bred by Benson, Maule & Co., Philadelphia, Pa.

The color of the plumage in the most perfectly marked birds is a metallic black, each feather ending in a broad, light steel-gray band edged with black; wings, black or dark-brown penciled across with white or gray bars; wing bows metallic black with considerable bronze lustre; tail black, with irregular penciled bars of brown, each feather ending in a broad, black band edged with light-gray. Shanks long, strong, and deep salmon or brown in color; color of beak, light horn. This variety is thought by many to be more tame and domestic in its habits and less inclined to roam, than some others.

The White Turkey.—This variety, sometimes called the White Holland Turkey, is not as commonly seen as the bronze and some of the other varieties. It is also not so large or hardy as the bronze variety, but is very attractive, having a pure white plumage, which forms a pleasing contrast with the bright red and blue white caruncles of the head and neck, and the glossy jet black tuft on the breast of the cocks. Its flesh is white and juicy, and its

downy thigh feathers are valued in the household. They are good layers and excellent mothers, generally mating quite early. They are not, however, bred very extensively in this country, as the bronze and some of the other varieties are much larger at the same age, and at maturity command a higher price in the market.

The Black Turkey.—The black turkey is more commonly bred in this country than the white, and is generally regarded as more hardy than the latter. It is bred in France more commonly than any other variety. The pure bred birds of this variety have a plumage of a rich metallic black,—the color of the legs a dark lead or slaty black. Among the common domestic copper-colored birds, many will be found of a dark color, nearly black, but these are only mongrels. Adult cocks of this variety, weighing less than twenty pounds, and hens weighing less than twelve pounds, are considered disqualified for the show-pen.

The Buff Turkey.—This variety is also considerably smaller than the Bronze, but will average about the weight of the white and black varieties. It is quite common in the United States, being frequently seen upon the farms where turkeys are raised. The color of the plumage is a clear buff throughout; the legs of a bluish-white or flesh color. The plumage of the hen is similar to that of the cock.

The Slate Turkey.—This bird differs from the three preceding varieties described principally in the color of its plumage, which is throughout of a very handsome slaty or ashy blue. The legs are light or dark blue. It is very rare, being seldom represented at our poultry shows.

The Crested Turkey.—This is an exceedingly rare bird, and may be regarded as quite a curiosity in the turkey family. Main says of it: "Although not of very recent date, the subjugation of turkeys has already produced marked varieties in our climate. The most remarkable is that of the tufted (or crested) turkey, as yet very rare, and whose tuft is sometimes white, sometimes black in color." A turkey of this variety, and from which the accompanying illustration was made, was exhibited a few years since at a New York poultry show, and attracted great attention. Temmick speaks of this bird as a "sport" only, and differing from the American wild turkey merely in the provision of a crest or tuft. In breeding, the crest is not always reproduced in the progeny, although with care in selection, for this object, this feature could probably become a marked characteristic, if desired.

The Ocellated Turkey.—This is a native of South America, where it is now found in a wild state. It breeds well with our domestic turkey, and the progeny is quite fertile, but it seems best adapted to a warm climate, both the pure-bred fowls and cross-breeds being too tender for our severe Northern climate; hence, it is unknown as a domesticated bird in the United States and Europe, although it was domesticated for centuries in Mexico before the conquest of that country by the Spaniards. It is the most elegant and brilliant in plumage of the whole genus. The ground color is bronzed green, banded with gold bronze and glossy black. Low down the back the color is deep blue and red; upon the tail the bands become fully defined and sharp, producing the peculiar ocellated or eye-like marking which gives the name to this species. The wattles are also very peculiar, and the head and upper portion of the neck are covered with wart-like protuberances, as shown in the cut on page 617.

General Management of Turkeys.—To those who understand the proper method of rearing turkeys, and have the necessary appliances and conveniences, it is not a difficult thing to accomplish, and always proves a profitable business when skillfully managed. In order to attain the highest success, considerable care and skill are essential, together with a knowledge of the habits of this fowl. In rearing large, strong turkeys, much depends upon the selection of the breeding stock. Farmers are generally very careless and indifferent in

CRESTED TURKEY.

this respect. It is too frequently the practice to sell off the largest and heaviest birds about Thanksgiving and Christmas time, and retain the late birds of inferior size for breeding purposes. This is a very grave mistake, for with fowls, as with horses, cattle, and other domestic animals, the best of matured parents should always be selected for perpetuating the stock. Another very objectionable practice is to breed only from yearling hens, the old birds being sold off under a mistaken idea of economy because they will weigh the heaviest. It should be remembered that the turkey does not attain its full maturity until the third year, and the largest and strongest chicks can only be secured from matured parents.

Turkeys will not bear confinement well, and must have plenty of range in order to thrive. They are impatient under restraint, and retain a love for roving,—a trait of the wild bird that has never been subdued or bred out by domestication. This roving disposition is the chief objection to raising them unless there is plenty of range for them to forage in, as

OCELLATED TURKEY.

they are liable to do much damage in gardens and cultivated fields. After the hens have fairly commenced laying they become more quiet, and are less inclined to roam, until they have the care of their young broods.

It is the custom with many successful breeders to remove the cock from the flock before the hens commence sitting, as he often does much harm when a nest of eggs is half hatched through his stupid and persistent attentions. Old turkey hens are more reliable as sitters than young ones, although it is thought by some that young birds are less liable to steal their nests, than old ones, and thus considerable trouble and loss may be obviated from the depredations of foxes, skunks, hawks, and crows, which latter are known to be great foragers on eggs. Turkey hens are generally good sitters, but are sometimes uncertain in this respect. A Cochin or Brahma hen is frequently used for hatching the eggs of turkeys, especially those

first laid. When the first eggs are to be used under a hen, they should be removed daily, and be cared for particularly in the chilly nights of spring.

A poultry breeder of considerable experience says: "All the first lot of eggs received I placed under hens for hatching, and you will find that the turkeys will have finished their second laying a few days before the hens have finished hatching. I then take the eggs from the hens and give them to the turkeys, and sometimes the turkey has only to sit a few days when she has her young. If I am compelled to leave some of the eggs with the fowls to bring out, I deem it an indispensable requisite to see to it that the hen is perfectly free from lice, using pulverized sulphur, etc., freely. I regard it as next to impossible for hens to raise young turkeys, for turkeys are exceedingly tender when young, and above all things they must be kept free from the parasites that infest the common fowl. They must not even be allowed to remain over night about the same building where the common chickens are kept. Do not be afraid of putting as many as forty or fifty young turkeys with the old mother turkey, but keep them in a dry, warm place, especially over night."

Nests for Turkeys.—Turkeys are very apt to steal their nests, being sly in their habits, and retaining considerable of the wild blood that has never yet been bred out, and perhaps never will be. It is therefore a good plan to make places frequented by them, and out of the way of intrusion, attractive in this respect, by placing in the corners of the fences and yards a few pieces of boards set up on end with a little straw or dry leaves behind them and a china egg half secreted in the rude nest, thus decoying the bird into laying in the nest and places selected for them. There is no necessity for making an elaborate nest; it may be fixed in a shady clump of bushes, in a thicket on the bare ground, or an old barrel or box may be turned on its side and placed on the ground among some bushes, thus providing shelter from the storms, and a secure hiding place so much coveted by the turkey.

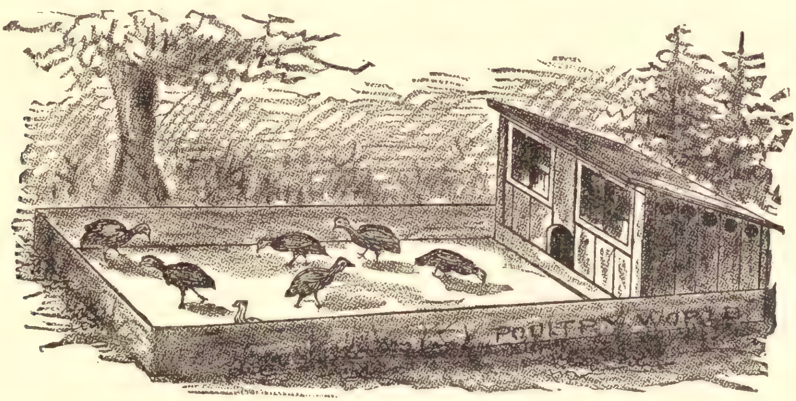
A hen turkey will lay from twelve to eighteen eggs before manifesting any inclination for sitting. When she wishes to sit, she will be found constantly upon the nest where her litter has been laid. When it is desired that she should lay farther before sitting, as soon as she is found on the nest over night, take her off and put her in a coop in the yard frequented by the rest of the flock and let her remain about four days, in the meantime giving her a liberal supply of food and water. About the fourth day she can be set at liberty again, and in five or six days afterward she will commence laying her second litter. When turkeys are used for sitters, it is well to place food and water by them daily where they can help themselves, as they are not apt to leave the nest often for this purpose. Several hens should be set at the same time so that the chicks of two hens may be given to one mother to rear.

A good authority says on this subject: "One turkey will take care of thirty young with as much ease as she manages half of that number. The hen that is released from maternal cares will very soon lay again, and hatch a second clutch. In setting the hens they should not be near to those that are to hatch later. They will sometimes abandon their nests to help take care of the young chicks that they hear near them. If the neighborhood is infested with vermin, it is desirable to remove them to the barn, or some outbuilding, where they can be protected. This requires a little strategy that is easily accomplished with birds that are thoroughly domesticated. The turkey should be allowed to sit on artificial eggs for a while. Then the new nest under cover should be a coop of some kind into which she may be securely fastened. The bottom should be about three feet square, and furnished with straw for the nest. Remove her to her new quarters in the evening, and fasten her upon the nest until the second morning. Then provide food and water, and remove the fastening and let her come off to feed. For the first time that she comes off, she need not be let out of the building. After this, if the door is left open, she will ordinarily go back to her nest as securely as if she were brooding out of doors. They are close sitters, feeding with great haste, and dusting themselves, and hastening back again to the nest. They brood their eggs for four weeks, but

sometimes it is prolonged a day or two. As soon as the chicks peep through the shell, the mother makes it known by a peculiar plaintive sound unlike anything heard from her until she has this new-born joy. A turkey will almost always hatch the larger part of her eggs, frequently every one. Sometimes the hatching goes on so rapidly that you find a whole nest of chicks before you suspect their appearance at all."

Care of Young Turkeys.—Like young chickens, the turkeys when first hatched require no food for twenty-four hours at least, and if not fed for thirty-six hours after hatching, they will not suffer, the yolk of the egg furnishing sufficient nutriment for the young birds for that length of time. They are, however, not as strong as newly-hatched chicks, in fact are exceedingly delicate, and should not be handled, but left entirely to the care of the mother hen. When about thirty-six hours old, they should be taken with the mother to a pen (which should be ready for them), and fed with hard boiled eggs chopped fine, and stale bread or cracker crumbs moistened with milk. Unless suitable food be given them at this early period they will be liable to die; a newly-hatched poult being the most feeble and tender of all domestic fowls.

They should also be fed regularly four or five times a day for the first two weeks, which will give them a good start. They eat but very little, and want it often, and nothing should



PEN FOR TURKEY POULTS.

be left over to become sour or mixed with the excrement. Never put the food where it will become mixed with dirt. The foolish practice, so tenaciously adhered to by old housewives, of making the young poults each swallow a whole peppercorn to make them healthy, is now generally discarded, such a diet being about as indigestible as a piece of lead. The mother bird should be fed all she will eat of corn meal ground coarse and mixed with milk, also grain, and be supplied with fresh water. They should be confined in a pen on a grass plot for about two weeks, until strong enough to accompany the mother, who will be liable to take her young brood on long rambles when they will be lost in the tall grass or grain fields, or become too tired to follow her, unless this precaution is taken. In such cases the little chicks find it impossible to keep up with the mother who soon gets out of hearing, and they perish for want of food and covering. Carelessness in this respect and exposure to wet before being fully feathered is the cause of more loss to turkey raisers, than all other causes combined.

A recent writer on turkey raising says: "There is no doubt but that the chief cause of the mortality among young turkeys is their exposure to wet before they are fully feathered. The ordinary turkey-raiser trusts a good deal to the instinct of the mother turkey, and the mother turkey, if left to herself, squats down just where night happens to overtake her; gets

up early in the morning and wanders around in the wet grass in search of food, and as a natural consequence more than half of her brood die of chills and cramps before they are a month old, and more than likely the other half is gobbled up by some four-footed prowler. Dew is about as fatal as poison to the young turkeys before they are fully feathered, and if you expect to raise your turkeys, and make the rearing of them profitable, you must keep them out of the grass when it is wet with dew, until they are about two months old. I have a large, well-lighted, gravel floored shed, where I can confine my young turkeys in the morning until the sun has dried the dew off the grass, and on many rainy days they are kept in the house all day. The mother hens are confined in slat coops placed along the rear of the shed. Where one raises the turkeys in large numbers, I think some such arrangement would pay, but the ordinary farmer who raises only a few dozen for market each year, would not care to go to the expense of putting up such a building."

After the first week or two, the egg and bread crumbs may be discontinued, and scalded corn meal mixed with skimmed milk and boiled potatoes may be given. Onion tops chopped fine and mixed with the mess, are also excellent. Grass, cut fine, or cabbage finely chopped, may also be given for green food. About twice a week a little Cayenne pepper should be put in their water or mixed with their food, as this aids digestion, and promotes warmth. The best way to prepare it is to make a tea by turning hot water on the pepper. By this means the pepper will be more evenly distributed among the whole flock, than if mixed in a dry state.

Sour milk or that turned to curd is also excellent for young turkeys. The whey may be drained out with a cloth strainer or colander, when the curd will be in a crumbly condition. Never scald the sour milk, as this will make the curd too tough and indigestible. Boiled liver or meat given every other day, will make them strong and quicken their growth. Never leave salt where they will eat it; carelessness in this respect might be the means of greatly diminishing the number of the flock. In salting cattle in pastures, and turning out old brine from meat and fish barrels, those who raise turkeys should be sure to see that no such refuse is left in places frequented by these birds. As the birds get older, cracked corn, wheat screenings, and buckwheat, may be given. All kinds of grain are relished by the half-grown turkey, such as Indian corn, with occasionally wheat, oats, buckwheat, and barley, for a change in diet; corn is, however, the best as a staple food for turkeys during the year. Animal food should be given occasionally, such as meat or meat scraps. Fruit and vegetables, cooked or raw, are also relished by them. Turkeys should always have access to coarse gravel, crushed oyster or clam shells, as well as pure water.

General C. P. Mattocks, of Portland, Maine, gives us his method of managing bronze turkeys as follows: "The true method in breeding Bronze Turkeys is, to begin with a trio of birds from the yards of some reputable and skillful breeder. If possible, let the hens be from eggs laid by one and the same hen turkey, and fertilized by means of the same cock turkey. The little chicks, for at least two weeks, had better be kept in a small, dry yard, and fed on boiled eggs, etc. The eggs may be hatched under hens or under turkeys, but turkeys are better as mothers, because they take their young on long tramps and thus enable them to get better food and more hardihood. At no time should young turkeys be allowed to go loose in the morning until the dew is off.

For morning feed, after two weeks, warm meal and boiled potatoes are good, with wheat screenings scattered over the ground. The warm feed should be given three times a day for the first two months, with cracked corn at night. As the turkeys grow old, the number of feeds may be decreased and whole corn substituted. Where there is no danger from foxes or other enemies, the old turkeys may be safely left to 'steal their nests,' and no one need visit their nests until the usual four weeks have passed, when, as a rule, the old turkey will leave her quarters for home with a fine brood of little ones. The size of Bronze Turkeys depends much more upon feeding while young, than most persons think. The breeder who

is earliest among his chickens and young turkeys in the morning, is the one who usually takes the 'lion's share' at the fairs.

If any symptoms of rheumatism appear, a frequent feed of red pepper sprinkled in the hot dough, will, with warm quarters, generally cause a change for the better. The greatest care must be taken in the selection of males, and, as with all other kinds of poultry, but perhaps in a more marked degree, careless breeding and a failure to kill off the unworthy birds, soon destroys the beauty and symmetry of a flock. Never mate brothers and sisters, but a *good* sire may be employed with a good daughter safely. If the turkeys can have good range in summer, and are hatched as early as July 1st, the business can be both pleasant and profitable. The Bronze Turkeys are wonderful for their good behavior in the matter of coming home nights. They are great wanderers, but never get lost, and do not, like the common turkey, wear one's patience out with hunting for them when night comes."

In southern New England where large numbers of turkeys are raised annually, it is the custom among many breeders of this bird, when feeding uncooked meal to them, to mix a small quantity of clean seaside sand with it, when mixing it with milk or water. This, it is claimed by those practicing the method, acts like gravel in aiding digestion, but it is also claimed that this mixture should not be fed later than three o'clock in the afternoon, for if fed towards night, it will lie heavy in their crops during the night, and prove injurious. A breeder of turkeys from Rhode Island claims to have lost but two birds out of a flock of four hundred and fifty-four raised during a single season, by this method of feeding. The quantity of sand used in this case was about one-sixth that of meal.

To Prevent Lice on Young Turkeys.—Wash the old turkey when taken from the hatching nest, with a decoction of tobacco, on the under side of the wings and on the body, but do not permit any to get on the young chicks. Put also an ointment made of yellow snuff and fresh lard under the wings, and on different parts of the body. If the young turkeys get lousy, put the same ointment on the top of the head, under the wings, and naked parts of the body. It is also a good plan to mix a little sulphur with the dough occasionally, which will be distasteful to the parasites. When young turkeys act sleepy and seem drooping, it is a pretty sure indication that vermin are troubling them, and it will pay to examine every bird, and take all the necessary precautions.

Shelter for Young Turkeys. — An extensive poultry raiser in southern Connecticut, says: "If you mean business in raising this crop, see that the hen and her brood are safely housed every night for a month at least after hatching. A vacant stable, or shed, or barn floor, or hovel, furnishes suitable shelter, and with little trouble after the habit is established. The prime object of this shelter is to guard the young against water and other enemies. Showers often come up in the night and drench the mother-bird, and if she attempts to move, some of the young will be drowned. Then, in the open field, they are exposed to skunks, foxes, and weasels, and sometimes to thieves in human shape, who can bag your birds at midnight, and remove them to unknown parts. Then the young chicks that roost on the ground for the first month, are more likely to have straight breast bones than those that take to the roost and balance their bodies on a fence rail, or the small limb of a tree. The birds get accustomed to go into the barn and other buildings, and it is much less trouble to yard them in the fall or winter, when you want to sell them for stock or for slaughter."

Another writer follows a different method, and confines the young poults in a pen for about two months, after which they are set at liberty, and with the mother bird are permitted to range at will. He says: "The turkey poult pen is a necessity while the young ones are coming up from the shell to six weeks old. This is a very simple contrivance, such as has long been in use among our best turkey breeders in late years, and which has been found both practical and highly useful. This pen is constructed by placing a board on edge, say

fifteen inches high, on three sides, oblong square, eight or ten feet by five. The rear is occupied by an upright, slant-roofed box, three feet by five, boarded tight, with a few holes at the eaves for ventilating it when closed up. Entrance to this coop is made inside the boarded pen, front of which may have a latticed or wired door, to be shut at night for security against prowling vermin.

The height of boarding described will confine the poults until they are six or eight weeks old, and the mother will not leave this pen because her young ones are unable to mount the barrier. It is an excellent arrangement for the poults, and keeps them dry and comfortable when they most need to be free from the rains or dews and dampness of the grass or open fields. Nothing is so pernicious, and to no cause can the mortality among turkey poults be assigned so directly as to their exposure to wet in their young days. This is what it is that frequently destroys them, and to the careless method too often adopted by the ordinary turkey raiser of allowing his little flocks to run about loosely in the early morning hours may be attributed more than half of all the losses experienced in the early season of the year which are so commonly complained of.

Confine the poults to such a pen, strictly, during the first two months of their lives. Feed them upon such food as we have described. House them at night, out of the heavy dews, in the way we have now directed, and protect them from the sun as well, and you may succeed in rearing five-sixths of all the young turkeys you can get hatched, ordinarily from April to June, annually. After two months old, the young ones may be set at liberty, and allowed to follow the roamings of the hen mother. It is well at first not to let them run at large while the dew is upon the grass. This chilly wet is an enemy to the tender young birds always, and occasions cramps frequently when exposed to the dampness alluded to. They will gather in the pastures and fields during their daily wanderings fully one-half of all the sustenance they need. Feed them in the morning before they start away, and at night they will eat heartily of the grain supper you provide. And all of them will "come home to roost" at evening. Accustom them to this daily good cheer at nightfall and they will always be on hand seasonably to partake of your hospitable bounty.

But if they fail to return at first, they should be brought home every night with as much regularity as the cows, and it should be the business of some one to count the broods, and see every bird on the poles. If this habit is formed early, it will require very little time to attend to them. They will come regularly for their feed at night, but after a time this will not be necessary. With a good range they will pick up insects enough to keep them in good thriving condition. Dry summers are most favorable for them. Insects, especially grasshoppers, abound, and they lose no time in foraging. From June to September they will in the main take care of themselves, and benefit the farm by the havoc they make among the insects. They will 'shoot the red' at about three months or less, and after this and their early moult, they will grow well if fed well, and come to maturity in good season profitably."

Roosts for Turkeys.—Turkeys are usually left to seek roosting places on trees or buildings, but this is a negligent practice; a place should be provided for them for roosting, the same as for hens. Mr. W. Clift, of Connecticut, an extensive breeder of turkeys, says: "Nothing is more common than to make the turkeys roost upon apple or shade trees near the house or barn, or even upon the shed and barn roofs, or other farm buildings. But this is a slovenly practice, and open to several objections. The roosting of the young birds upon small limbs is liable to injure the breast of the chicks while they are in the gristle stage of growth, and in zero nights the feet of adult birds are much more liable to get frozen upon a small limb than upon a stout pole, broad enough to balance the bird without clasping. The toes are more completely covered with feathers and protected from the frost. The roosting of birds upon the roofs of buildings is a filthy practice that no thrifty farmer should tolerate. The manure is necessarily wasted. A properly constructed and located roost guards against

these evils, and makes an important addition to the manure heap. The wild turkey, of course, lodges in trees during the winter, but she has the choice of location, and seeks the shelter of thick woods, which modifies the temperature.

One of our best poultrymen, who raises some two hundred turkeys yearly, has located his roost at the south end of his horse barn, where there is partial shelter from the northeast and northwest winds in winter. Forked posts form the support of the scaffolding—two front posts about eighteen feet high, and two rear posts about fourteen feet high. The front and rear post at each end of the scaffold are connected by a stout heavy pole four or five inches in diameter, kept in place by the forks at the top of the posts. Upon these side poles which slope like the roof of a shed, smaller poles three or four inches in diameter are spiked at each end, forming the roost for the turkeys. These roosting poles are about two feet apart, of red cedar, and are very durable, with a strong odor, which is said to be a safeguard against insects. The white cedar of the swamps, or the arbor vitæ, or any of the resinous woods would answer the same purpose. A board is put up at the lower side of the scaffold, and the young turkeys mount the roosts by this board until they are old enough to fly.

The advantages of such a roost are the following: There is a fixed place for the birds, where the person who has the care of them can look for them at morning and evening, and learn by counting if any are missing, by straying or by theft. By putting a few loads of peat, muck, or headlands under the roost, and adding to it occasionally, an excellent compost can be made. The food of turkeys is grain, and in summer very largely insects, and the droppings are rich in nitrogen. Any thrifty farmer will understand the value of this item. The scaffold, being fourteen feet high, is protected from foxes at night, and the turkeys are much less liable to be stolen by thieves. Turkeys that roost upon fences by the wayside, or upon apple trees, are very tempting to low bred people with indistinct notions of the eighth commandment. On the roost turkeys can only be approached by a ladder. In the zero nights of winter, if the roost has the shelter of a building, or of a belt of evergreen trees, the turkeys are saved from frost bitten feet."

Crooked Breasts.—A distortion of the breast-bone is occasionally seen in all poultry, giving the fowls a deformed appearance, but more frequently, perhaps, in turkeys than in barn-yard fowls. It is an indication of a weak constitution, or of an injury received while the bird is young, such as sitting on improper roosts, such as small limbs of trees, etc. The writer had a valuable Brahma cockerel become deformed and useless for breeding purposes by sitting on a roost that was not horizontal, one end of which was considerably higher than the other. This deformity is sometimes occasioned by too close in-breeding. When this is the cause, change either the cock or the hens. Never breed from deformed birds; they are only fit for table use, such deformity not injuring the flesh at all, but would be likely to affect the market value.

Fattening Turkeys.—Turkeys should always be sent to market in prime condition. The true economy in feeding turkeys is to give the chicks all they can digest of good food, from the time they are out of the shell until slaughtered, which is generally in about seven months. Turkeys that have an extensive range will pick up considerable food in this way, but they should be fed at regular intervals during the day. They should be put upon a regular course of fattening as early as the middle of October when the birds are to be ready for Thanksgiving. The smaller birds should be reserved for Christmas and New Year's markets, as they will continue to grow very rapidly, and will well repay the expense of longer feeding. The basis for fattening food for turkeys should be old corn, either as grain or cooked meal. Warm cooked meal mixed with boiled potatoes is an excellent diet to feed occasionally.

The rations in the morning should be warm food. Always have plenty of feeding room in troughs, so that all can have a chance to get all they wish, with no crowding, and feed just what they will eat up clean. Milk is excellent in fattening. New corn will be liable to make the bowels loose, and is not as good for fattening turkeys as the old. When the bowels are loose, scalded milk with a little cayenne pepper sifted will generally correct the evil. On some turkey farms, where the birds are raised in large numbers, the birds are kept in a enclosure of two or three acres, and a supply of corn and water kept constantly by them, besides feeding once a day with cooked meal. A reliable gentleman informs the writer that in raising a flock of about five hundred turkeys, it was his practice during the fattening season to turn from eight to ten bushels of corn on the clean grass in long rows across the field, and permit the birds to help themselves, replenishing the supply when it became exhausted. The range was so large that the food would not become contaminated with their excrement, and having a supply of food at hand the birds did not range much, but lay about idly and fattened all the more readily.

Preparing Turkeys for Market.—Although turkeys are apt to be a little shy and are not naturally quite as tame as other fowls, if well cared for and gently treated they will become quite tame and may be caught without difficulty. When provided with a roost, they can be taken from this very readily. They will be liable to grow shy after some of the flock have been slaughtered. When this is the case, a slip-noose at the end of a strong string spread upon the ground with corn scattered within it will prove quite serviceable. When the bird steps within the circle of the noose draw it quickly and the turkey is caught by the leg.

The writer previously quoted gives his method of dressing turkeys for market as follows: "The night before slaughter the birds are fed as usual, and the barn floor, if not already tight, is made so by nailing boards over the mangers. As soon as the turkeys come from the roost in the morning, the barn doors are open and the turkeys are driven in upon the floor and the door closed upon them. They are now secure, and can be caught as wanted, without bruising the flesh. In a separate apartment in a stable, or under a shed, make as many nooses of strong cord as you have pickers, and sling each bird by the feet as high as will be convenient for handling. With a sharp-pointed penknife, stick them in the mouth by making a gash across the roof near the top of the neck bone, allowing the point to penetrate the brain.

As soon as the bird is dead, work lively at the feathers with both hands, and pick clean, pin feathers and all; cut off the neck as near the head as possible; cut off the wings and draw the crop and entrails. The bird should be taken out of the slip-noose ready for market. As fast as the birds are dressed, they should be put upon a clean board or table to cool. If the weather is very severe the picking of the pin feathers and the drawing may be done in warmer quarters. Great care should be taken not to break the skin, and not to leave a feather. When the turkeys are thoroughly cooled and ready for packing, place a layer of clean rye straw upon the bottom of the wagon and pack them in rows upon their breasts. Clean the necks as thoroughly as possible, draw the skin over the end and tie firmly. Strict attention should be paid to cleanliness in every part of the process, to keep up your reputation for sending only finished products from your farm to market. It will make a great difference in the long run with your bank account."

When scalding is resorted to for removing the feathers the directions should be the same as for dressing chickens previously given. Always draw the birds before packing, and never permit the poultry to freeze before packing, as it gives a blue, pinched appearance. The packing should be done according to directions given for packing chickens.

Profits of Turkey Raising.—When well understood, turkey raising is attended with large profits since the outlay is comparatively small, and they always command a good price

in the market. A successful breeder of these fowls in New England says in this connection: "One great secret in raising turkeys is to take care of them and take care of them all summer; and even then you cannot always raise them, for sometimes they will not lay, or they will not hatch, or something will befall them. Sometimes we raise turkeys without much care, when the season is specially favorable, but generally the measure of care is the measure of success. A boy ten or twelve years old, with a little direction from his father, can easily take care of two or three hundred turkeys, and he cannot earn so much money on the farm in any other way. It is an old maxim, that if a thing is worth doing at all it is worth doing well. Some may think this constant care is too much trouble. If you know a better course, by all means pursue it.

This painstaking has made turkey raising about as sure as any other branch of farm industry. I have usually kept from eight to eleven hen turkeys for breeders, and have raised from ninety-nine to one hundred and thirty-seven in a summer. A few years ago I sold my turkeys for 27 cents a pound; they amounted to $380.40. The next year I sold for 25 and 27 cents a pound; gross amount of sales, $386.18. That year I kept an account of expenses, and calculated the net profit at $213.58. The year following I sold at 25 cents a pound; amount of sales, $311.37. I would rather raise turkeys and sell at 15 cents a pound, than to raise pork and sell at 10 cents a pound. Perhaps in fattening pork you can save the manure better, but the turkey droppings, if gathered from under their roosts and saved every week and kept dry, are worth half as much as guano, and are certainly worth a cent a pound."

A gentleman from Rhode Island informed the writer that when a boy of sixteen years of age his father told him if he would take care of the turkeys during the summer he might have all the proceeds from them in the autumn. Stimulated by this prospect, he made his plans accordingly, utilizing all the eggs for sitting that the small flock of turkeys laid, and purchasing a number in the neighborhood, setting them under both hens and turkeys, and so managing that two or three broods would come off about the same time, when the young chicks would all be given to one mother, in which case the others would soon be laying again. At the time of marketing the turkeys, out of four hundred and eighty-six young poults that started in life, four hundred and eighty-four were sold, which was certainly rare success. In considering the average weight and price of turkeys sold in the market, it will readily be seen that this young man was well repaid for his summer's labor. When well understood, and properly managed, we believe there is nothing that the farmer can raise that for the outlay will bring a larger profit than turkeys.

In fact, every department of poultry raising may be made quite profitable under suitable management, and if the practical instructions given in this work relative to it were fully carried out, success must inevitably follow, as a general result. We are indebted to the Editor of the *Poultry World* of Hartford, Conn., for permission to copy a number of cuts in this department from his excellent journal,—a publication that has done much to awaken an interest in improved breeds of fowls, as well as to instruct in the enterprise of practical and profitable poultry raising in this country.

DUCKS.

THE various breeds of domesticated ducks are supposed to be descended from the Wild Duck or Mallard (*Anas boschas*) which is distributed so widely over Europe and a large portion of North America. Although frequenting nearly all latitudes, its favorite resort seems to be in the temperate zone. In color the Wild Duck resembles the Rouen, although its form is more slender and upright, and its habits more active than the latter. It is also much smaller in size than the domesticated bird. Ducks are profitable poultry for the farmer to raise, if they can be given their liberty to forage, although they are not as profitable as hens when kept in confinement, because they will consume more food, and lay a less number of eggs. The ducklings are the most active insect hunters known, and in low, marshy grounds, ponds, or streams, they will thrive on grass and plants, feed on myriads of insects and their larvae that may be found in the water, imbedded in the mud or adhering to vegetation, requiring an evening meal of grain or other food to entice them to return regularly to their homes. In fields and gardens they are exceedingly valuable as insect destroyers, while they are easily reared, their feathers are valuable, and their eggs and the young ducks bring a good price in the market.

As to which varieties are most profitable, or best adapted to the farm, breeders of these birds differ in opinion, as some breeds possess certain qualities in a greater or less degree than others. It is, however, considered by many that when flesh and feathers are the principal objects desired some of the white breeds are to be preferred; but if the flesh alone is the prime object, and handsome ornamental birds are wanted, the Black Cayuga and the Rouen should be chosen. Rouen ducklings are thought to be the best insect hunters of all the duck family among the large breeds, while the common gray duck is the best for this purpose among the small breeds. The flesh of the Muscovy Duck is inferior to that of others, while the Aylesbury, Rouen, Pekin, and Cayuga will nearly equal them in size, and are much superior in quality of flesh. The illustrations of the last four in this department represent fine birds from the breeding pens of Mr. J. Y. Bicknell of Buffalo, N.Y., who is one of the best known breeders of this class of poultry in the country.

Aylesbury Ducks.—This is regarded as one of the best of the English breeds of ducks. They have somewhat degenerated in size in this country, but by careful selection in breeding, using for this purpose only the largest and strongest birds, this tendency may be obviated. They are not quite as large as the Rouen variety, although they nearly equal the latter in this respect, frequently attaining the weight of eighteen pounds per pair. Their plumage is of a pure snow white throughout, with flesh-colored bills and legs of an orange hue. They are oval in shape, with a broad, long back, full, round breast, strong wings, and short, stout legs. The drake shows very handsome curled feathers in the tail. Their eggs vary in color, some being quite white, while others are of a green or cream color.

They commence laying in February, and continue for about five months with two or three brief intervals. They are excellent foragers, but will return to their home regularly at night. They are liable to fall down behind, owing to the stretching of the abdominal muscles. In breeding, such birds should be avoided, whether male or female, as they are apt to be sterile; besides, this is a disfigurement. As soon as this defect is noticed, kill and dress such birds of whatever breed for market.

Rouen Ducks.—This breed of ducks most closely resembles the Wild Duck, or Mallard, in plumage, of any of the duck family; domestication, has, however, increased its size and weight, and given it a greater aptitude to fatten. It is the largest domesticated variety known, and is supposed, as its name would indicate, to come originally from the city

of Rouen, Normandy. Mr. W. H. Todd, of Vermillion, Ohio, says of them: "One pair that we exhibited at a show, weighed nineteen and three-fourths pounds; and at home, before the shrinkage of the trip, twenty-one pounds, which was at that time the largest pair in the world." Drakes of nine or ten weeks old have been known to weigh more than twelve pounds per pair. They are the most quiet of ducks, and seldom wander, easy to raise, and will do well with only an abundance of drinking water, although all water fowls attain their best condition when permitted to have access to a small pond or stream of water. The plumage is very beautiful, being changeable in color, with the elegant and decided markings of the Mallard.

The head is long, and in the drake of a lustrous green color; the bill is long and broad, of a greenish-yellow hue, and wider at the end than the base. The neck is long, slender, and colored the same as the head, with a distinct white ring on the lower part that does not quite meet in the back. The upper part of the back is ashy gray blended with green, shading to a deep lustrous green on the lower part and rump; the breast is broad and deep, the front of a rich purplish-brown, or claret-color, which extends down the legs; body broad, long, and deep, the under part of a handsome gray ending in solid black under the tail, which is of a dark-brown color; tail coverts black, with metallic reflections. The wings are grayish-brown in color, blended with green, with a broad band of a purplish tinge, which has beautiful reflections of green and blue in the sunlight. This band is edged distinctly with white. The plumage of the thighs is gray; legs and feet orange, with a slightly bluish tinge.

The head of the duck is a deep brown, with two light-brown stripes on each side, running from the beak behind the eyes. The plumage of the neck is light-brown, penciled with a dark-brown, and entirely free from the white ring that characterizes the drake; the back is light-brown, marked with green; the breast a dark-brown penciled with a lighter brown, the body a grayish-brown, with each feather distinctly penciled with a very dark-brown; wings the same as the drake. They do not come to maturity quite as early as the Aylesburys, but are prolific layers of rather thick-shelled, bluish-green eggs; they are also excellent foragers The flesh is very delicate; the young ducks grow very rapidly, and are easily fattened for market. Like many of the duck varieties, they are apt to have the disability of falling down behind, or what might be called an abdominal protuberance.

Pekin Ducks.—This breed of ducks was imported into this country from China in 1873, and are quite an acquisition to our water fowls, being hardy, easily reared, an excellent table fowl, and good layers, while their yield of feathers is nearly as great as that of an ordinary goose. They are white or creamy-white in plumage, with a medium-sized deep yellow bill, and legs of a reddish-orange color. They are large in size, although not equal to the Rouens and Aylesburys in this respect, but owing to their heavy growth of loose and fluffy feathers, they look much larger than their weight would indicate. While swimming, no duck shows so much body above the water-line as Pekins, since their feathers stand out so loosely from the body, while those of other ducks lie down compact and close; for this reason their weight is apt to be overestimated. Their eggs hatch well, the ducklings raise easily and mature rapidly, and are said to be larger at six weeks old than any other breed, which makes them valuable for market at this age. They are excellent foragers, and can be easily raised where there is only sufficient water for them to drink.

Mr. Todd says: "They need no more water to swim in than chickens; cannot fly or climb fences more than a mud turtle, and are so easily restrained that they can be kept within low fences, and almost anywhere." Mr. W. Clift, of Connecticut, who has raised them for several years, says of them: "This variety of water fowl is unquestionably the result of thorough breeding for a long course of years for economical ends. Where the population is so dense as in China, they are compelled to economize in the use of animal food, and much

more attention is paid to the breeding of poultry and fish than in this country. Many live upon rafts or in boats, and keep large flocks of ducks as a means of subsistence.

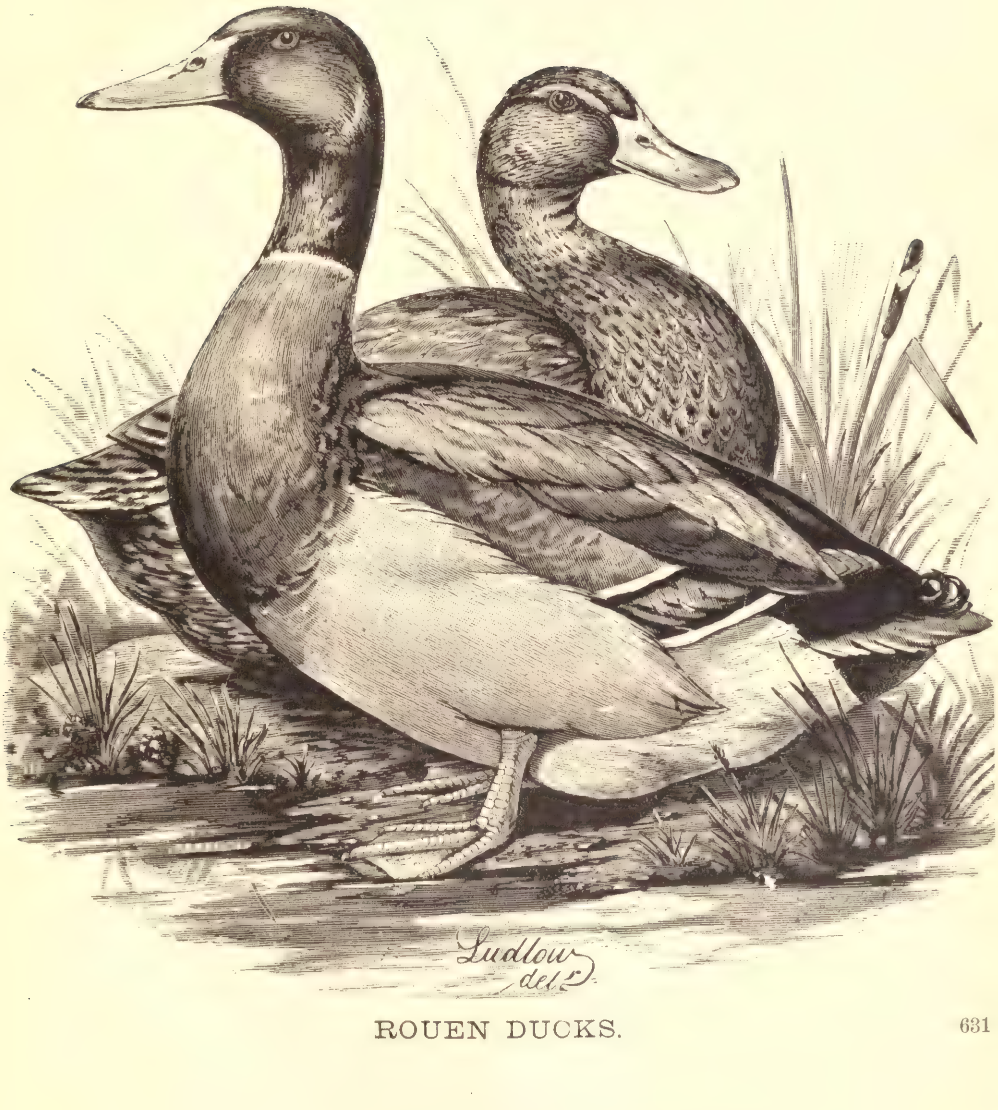
The Pekins, without doubt, come from the Mallard duck, and are the largest of all its varieties. They cross readily with the Rouen and Aylesbury, making larger birds than these, but not equal to the Pekins. Some of the Rouen grades come out clear white, but are readily distinguished from the pure Pekins by the shape of their bills and smaller size. Some of the grades are nearly solid black, and remarkable for their soft, glossy plumage. Others come out looking very much like finely bred Rouens, only with a slight derangement of the plumage. The cross with the Aylesbury seems more natural. The grades are readily distinguished by their lighter bills, smaller size, and different build behind. After experimenting with the crosses for many years, we do not find any improvement upon the Pekins in size, or beauty of form or plumage. We claim for the Pekins a comely form of pure white, which makes them a beautiful object upon the lawn, or for small bodies of water in ornamental grounds. They are exceedingly domestic, easily controlled, and will come at call, when far off upon the water, which makes them desirable pets for children.

They are a very hardy breed, and, judging from the experience of several years, are much more easily reared than Rouens or Aylesburys. They seem larger and stronger when they leave the shell; after a week with the hen may safely be put in flocks of about fifteen, and with a barrel or box for shelter will take care of themselves. They are as easily raised as chickens, and should always be hatched under a hen, as the ducks will pay much better to be kept laying than to be used as mothers. The young ducks require no more room or water than chickens, and do not need water to swim in until they are old enough to forage for themselves. Their instinct leads them to seek their living in the water, and they will wander away from the yard along brooks and ditches unless restrained, but they are easily kept within bounds, being too heavy when grown to fly well, and having been bred for many generations for flesh and eggs, their wings are very short. They mature very early, and in the vicinity of our summer resorts can be marketed in July and August at very high prices; are very prolific, laying, under favorable circumstances, two hundred eggs in a season. After breeding and observing the Pekins from their first importation, we think that they are entitled to the front rank among our useful aquatic birds."

The Pekins commence laying in February, and continue to lay for about five months with two or three brief intermissions. It is better that the ducklings should not have access to water, except to drink, until they have a good growth of feathers.

Cayuga Ducks. — The Cayuga Duck is an American breed supposed to have originated near Cayuga Lake, New York, from which they take their name, and where they abound in great numbers. It has long been domesticated in the United States and Canada, and for several years in England. They are decidedly a water duck, and rarely rise from the water, while they are so clumsy on land that they seldom wander far. Their weight at maturity is from twelve to sixteen pounds per pair.

The head is small and slender; bill broad, short, and dark or black in color; neck of medium length; back long and broad; breast full and prominent; body long, round, and plump. Their plumage is metallic black throughout, with beautiful green reflections on the head, neck, and wings; legs dark-slate or black. Their habits are quiet, while they are extremely hardy, early in maturity, prolific layers, and their flesh has a rich, game flavor, although a little dark; and when dressed for market, their skin is quite yellow. In breeding, the darkest males should be selected, since they incline to breed occasional white feathers in plumage. For rearing entirely on land, they are not as good as the Rouen and some other varieties; but in the vicinity of lakes, ponds, and streams, it is one of the best for all practical purposes.

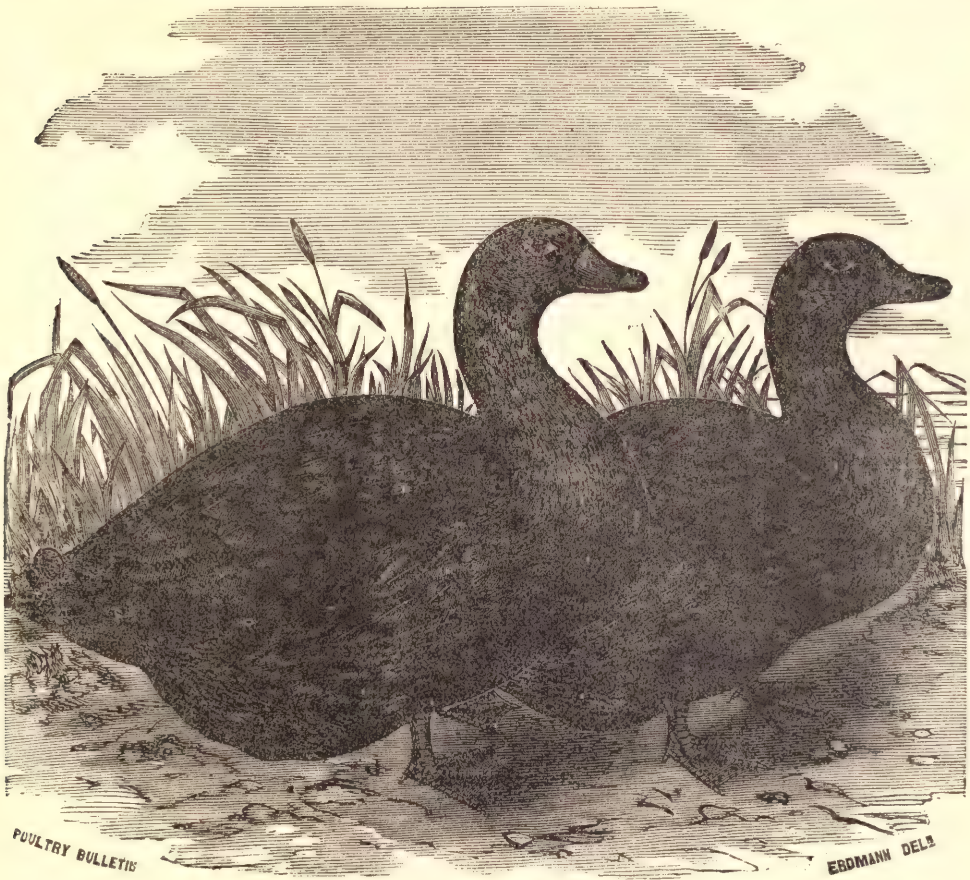


ROUEN DUCKS.

PEKIN DUCKS.

Crested White Ducks.—These are of medium size, pure white in plumage, with large snow-ball like crests on their heads, making them quite ornamental, as seen by the illustration of this breed. Their bills are of medium size and yellow in color; legs light orange. They are hardy, easily raised, good layers, and although comparatively rare, are a profitable breed. There are other crested varieties, such as the Black Poland, the Crested Amoor, and a rare species, said to be of American origin, and described by Latham as ashy gray in color of plumage on the body, while that of the neck is of a straw yellow, mixed with spots of a reddish brown.

The Crested Amoor duck is found in the northern province of Chinese Tartary, where the Amoor River enters Songoria, and is quite unlike any of our wild or domesticated

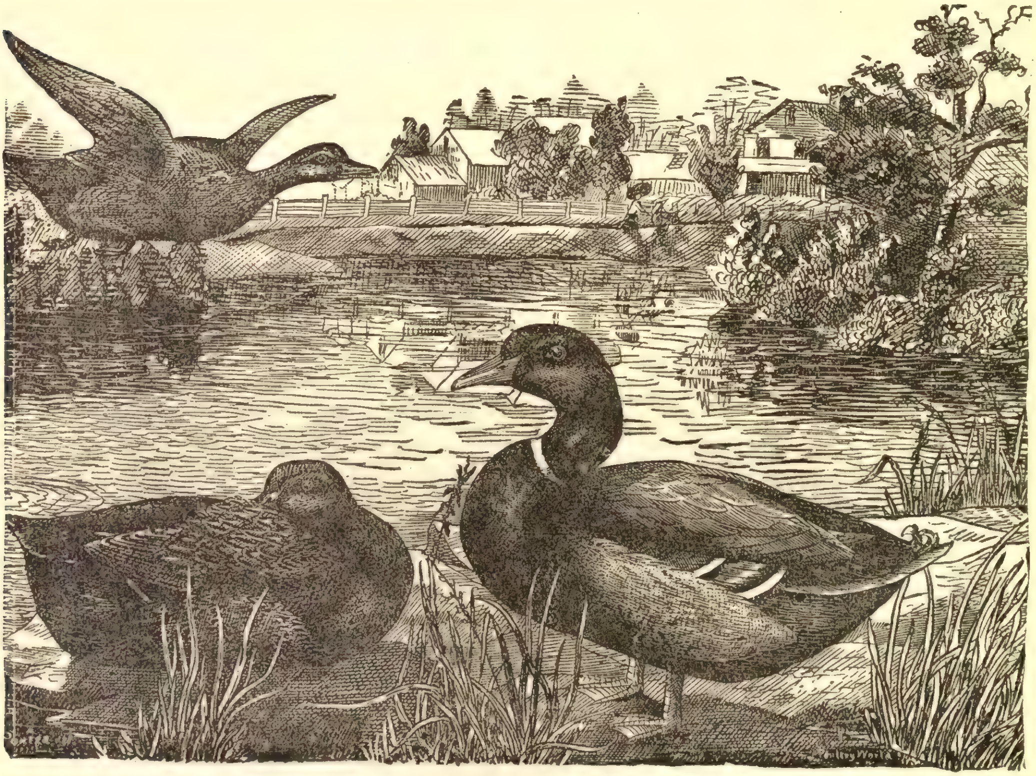


CAYUGA DUCKS.

breeds. It is described by a recent writer as follows: "It is much larger than the Rouen, the feathers on the neck and back of the drake are fine and plume-like, the crest is a pointed tuft of stiff feathers, somewhat crispy and inclined to curl toward the head, the bill is black and extremely long, the plumage is of a dark blue black prismatic, with fine gold dust colored spots on the neck and throat, the wing speculum dark blue edged with white, the tail a dark blue, and the under feathering ashy gray.

These birds are represented to be very prolific. It is said, with proper care, that they will lay eight months in the year. The drakes often attain ten to twelve pounds when well fattened. Their flesh, though dark in color, is sweet, tender, and juicy, and for delicacy and richness of flavor there is no aquatic fowl to surpass them."

Call Ducks.—There are two varieties of the Call Duck,—the Gray and the White—that bear the same relation to the large breeds that the Bantams do to the other barn-yard fowls, they being much smaller in size than the average domestic duck, and very active; and for this reason are sometimes called "Bantam Ducks." They are bred as small as possible by all who strive to win prizes with them at the shows. The Gray variety are very similar in plumage to the Rouen breed, so much so that they look like miniature Rouen ducks, while the White are pure white. They are exceedingly ornamental upon private ponds or lakes, and make very pretty pets. They are also very active little creatures, especially during the breeding season, and are gaining in popularity among cultivators of this class of birds. They have a loud and oft-repeated call; hence their name.

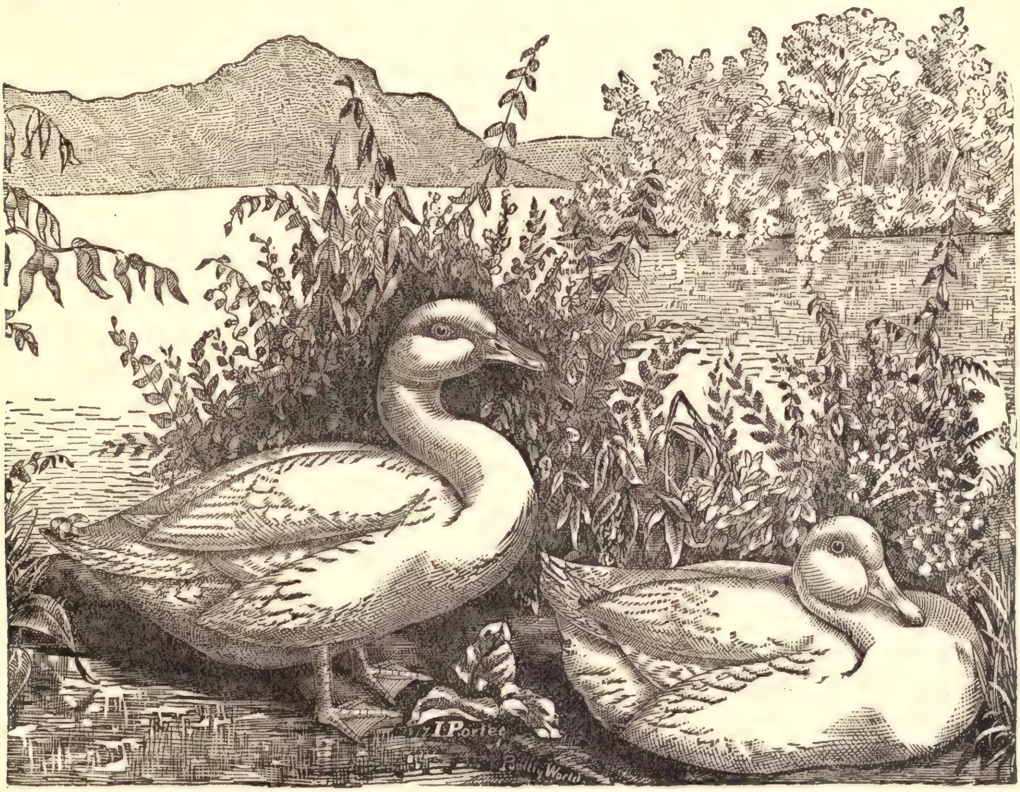


GRAY CALL DUCKS.

They are much used as decoys in wild duck shooting, and for this purpose are made up of a cross between the common small duck and the wild Mallard, the result being a compound of the tameness of the domestic variety, with the power of flight of the wild bird. The decoy bird is trained to fly from the hunter's feet to meet an approaching flock of wild ducks, and at its master's call return to him, leading the flock within reach of its master's shot. These little creatures possess great intelligence and can be easily trained for this purpose.

Black East India Ducks.—This variety has been known under various names, such as East India, Labrador, Buenos Ayrean, and Brazilian ducks, etc. They are closely related to the Mallards, and small in size, with plumage of lustrous greenish-black throughout. They are very beautiful birds and exceedingly hardy, but cannot be regarded as profitable for practical purposes, as the larger breeds.

Muscovy Ducks—Sometimes known as the Musk duck. This breed seems to be a distinct species, as the progeny of a cross between this and the common varieties is generally unfertile. The name musk duck is derived from the fact that the odor of musk pervades the skin, which, however, is not present in the flesh when cooked. Muscovy is supposed to be a corruption of this term. While the Mallard duck is found wild in the northern regions of America, Europe, and Asia, the wild Muscovy is found only in the warmer regions of South America, while it is never known to migrate. The drakes are larger than those of any other variety, frequently reaching eleven to twelve pounds, while the ducks are rather small in size, not averaging much over six pounds. There are two varieties, the white and colored.



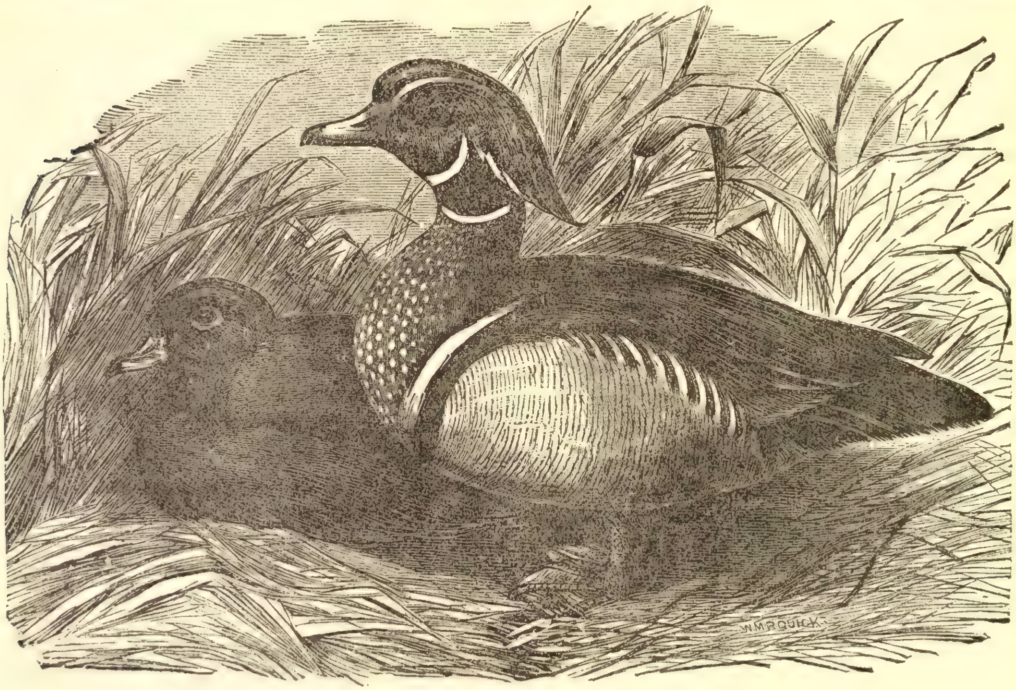
WHITE CALL DUCKS.

The former are pure white throughout in plumage; the latter is a very dark and rich blue-black, sometimes broken with white, of which there is a bar on each wing, and more or less about the head and neck. The darker plumage is exceedingly lustrous; the feathers on the back of the drake being quite fine and plume-like in appearance. They are very peculiar in their appearance, the head and face being carunculated or covered with bright red protuberances, that is, the cheeks are naked, with a scarlet fleshy space around the eyes, and the base of the bill is also carunculated. Mr. Wright says of the drake of this species: "The breed is very large, and the carunculated appearances are in lines far more conspicuous, and give to him in conjunction with a peculiar leer we have never seen in any other creature with feathers on, an aspect almost diabolical."

They never quack, and are favorites with those who admire what is odd in nature. Their flesh is good, and they may be said to fairly equal any other breed in egg-production. They care little for water, are good foragers, and are said to be very useful in devouring

large quantities of Colorado beetle or potato bugs. The period of incubation is five weeks. This bird has been domesticated throughout England and Germany for many years, as well as other portions of Europe, it being also quite common in this country. In a wild state the nests are sometimes built in the branches and sometimes the hollow of trees near the water. About the season of pairing, the drakes are said to fight desperately, and this quarrelsome disposition seems to be inherited by the domestic bird to a considerable extent.

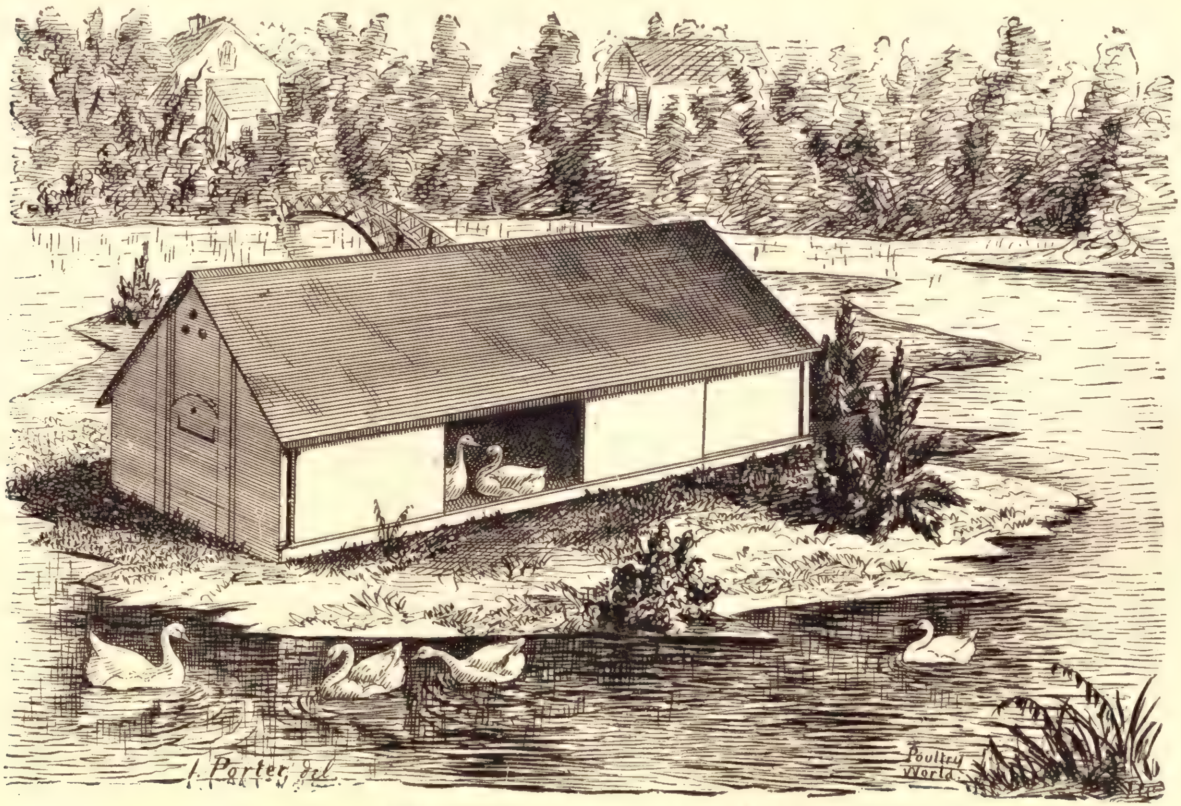
Mandarin Ducks.—These are a Chinese variety, sometimes called the Chinese Teal They are quite rare in this country, although more commonly seen in England. They are small in size, but have an exceedingly gorgeous plumage. Mr. Wright describes them as follows: "The shape is light and neat looking, but the plumage of the drake almost defies description, nothing in the poultry world being so bright and gorgeous. The head has a long crest pointing backward, and which can be raised or lowered at will; the color of this crest being green and purple on the top, shading into chestnut and green in the long feathers which



CAROLINA OR WOOD DUCKS.

extend backwards. A broad stripe of rich cream-color extends from the front of the sides of the head across the eye to the back of the neck.

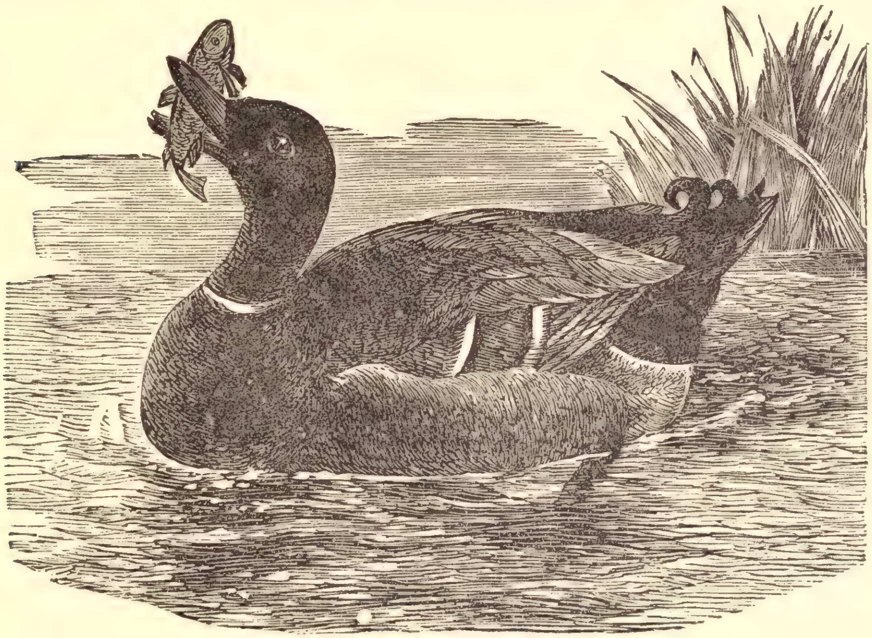
The neck is furnished with a collar or ruff of rich brownish-red feathers, somewhat resembling hackles, and the front of the neck and sides of the breast are a rich claret or purple. Across the shoulders are two beautiful stripes of clear white, each shaded with black, behind which the sides of the bird are of a greenish or ashy yellow, gray, beautifully and most delicately penciled in very fine lines with dark gray or black. The wings are furnished each with a peculiar shield or fan, standing nearly erect, and which are of a bright chestnut color, beautifully edged with green or blue. The feathers of the back are a brilliant light brown, and the under parts white or nearly so. The quills or secondaries are brownish gray, edged on the lower web with white. The bill is crimson, the legs a lightish pink, and the eyes a bright black. The garb of the duck is much plainer, being a mottling all over of greenish brown, with grayish under parts. About May the drake loses his conspicuous



HOUSE FOR WATER FOWL.

feathers, and even his wing fans and crest, and becomes very much like the female; in August he again begins to resume his fine clothing, and by September is again in full plumage."

Carolina Ducks, also known as "Wood Ducks," or Summer Ducks," are natives of South America. They are beautiful specimens of water fowl, having a very gorgeous plumage, and a graceful plume of feathers falling back from the head. The drake has a red bill margined nearly to the tip with black, with a spot of black between the nostrils and a kind of hooked point at the end; the head and pendant crest are a rich, glossy bronze-green shading off into violet, and marked with a line of pure white running from the bone of the bill over the eye and another band of white from behind the eye. The upper portion of the neck is of a violet hue, banded with white in front, curving in the form of a crescent behind the eyes; breast dark brown tinged with violet, marked with small white spots; the back a bronze tinged with green; wings blue and green with some markings of white; tail black tinged with green; tail coverts deep black tinged with yellow; legs yellowish red. The head



THE MALLARD DRAKE.

of the duck has a small crest, and although similar in color of plumage to the drake in some respects, it is more subdued. About June the plumage of the drake changes to nearly the same color of the duck, but in September he is in his gorgeous plumage again. These birds, like all wild fowl, increase in size as they are domesticated. Their beauty of plumage renders them great favorites, while they will become very tame when gently treated, and seem to like to be handled and petted.

Mallard Ducks.—Although these fowls are considerably smaller than the Rouen, they resemble the latter so closely in color of plumage and other characteristics, that a separate description is unnecessary in this connection.

General Management of Ducks.—There is much pleasure, as well as profit, in raising ducks when properly managed. They should be given sufficient range to forage and hunt for a part of their living, and prove excellent help in destroying insects. A brood of young

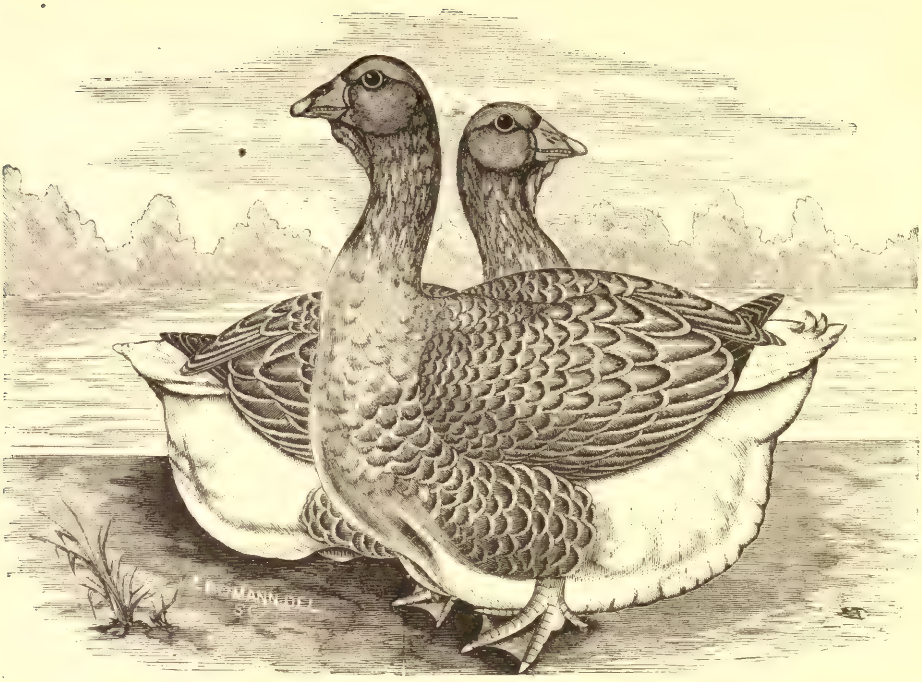
ducks in a garden would well pay their raising merely as insect destroyers, provided no other profit could be secured from them. When kept in confinement they are not as profitable as hens, because they will consume more food, and lay a less number of eggs. Although water fowls and ducks seem more happy and contented when having access to their proper element, a pond, stream, or other body of water of some kind, still they may be raised upon farms where there are no such water privileges, and seem to thrive well. Ducklings mature early, grow rapidly, and at six months old they are ready for market and bring a fair price. Unless there is a suitable place for hatching and rearing, it is better to set ducks' eggs under hens, Cochins or Brahmas being preferred.

The breeding ducks should be kept in their yards in the morning until about ten o'clock, by which time they will have laid their eggs, after which they can have their liberty for the day. It is a good plan to keep them laying through the breeding season, and set all the eggs laid by the ducks under hens. It is surprising what a large flock can be reared in this way from a trio of ducks. April, or the early part of May, is a good time for setting ducks' eggs. The young ducklings will then make their appearance about the time the grass and insects will appear. When ducks are set, they should have from twelve to fifteen eggs, and have a separate division of the duck house kept for this purpose. The door of her house should always be left open during the day, and she should have sufficient water near by to bathe in whenever she wishes. The average time of incubation is twenty-eight days.

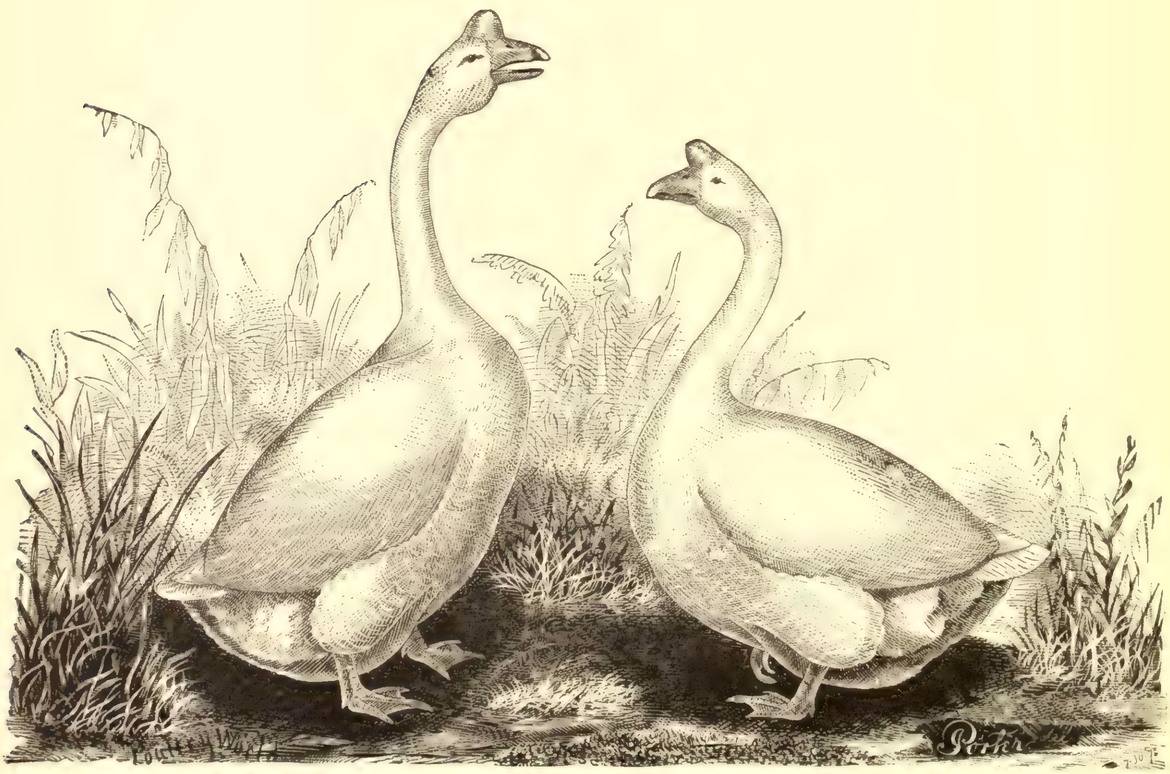
When hatched, the ducklings should not be disturbed for twenty-four hours, at the expiration of which time they will be ready for their first meal, which should consist of hard boiled eggs mixed with oatmeal, or stale bread crumbs soaked in milk; afterward, when three or four days old, give them oatmeal mixed with milk; corn meal scalded and fed warm; boiled potatoes mashed and also fed warm. They will feed upon the tender grass and insects, and will soon consume all the waste of the kitchen, and if a little pains be taken to prepare the food in a proper manner, there need be but little outlay for their keeping.

It is a good plan to let them have a run in the garden each day. If very young ducks are allowed access to a river or stream, they are apt to fall an easy prey to turtles, snakes, etc. Artificial ponds may be constructed for ducks, but they are objectionable unless they can be supplied with fresh, pure water, as otherwise they would be liable to become stagnant. The ducklings of the larger breeds may be made to weigh nine or ten pounds per pair at ninety days from the shell. Ducks should be fed every night when they return from their foraging expeditions, which insures their regular return. Feed them about the same as chickens, often, and all they want, if large birds are desired. When two months old, coarser feed may be given. During the laying season, wheat, oats, milk, ground bone, a variety of grain, mush or scalded meal, meat, egg shells, oyster shells, etc., should be given. Ducks will lay better when they have access to ponds or streams, as they there find their natural food. All ducks are heaviest and fattest in December. Later, as the breeding time approaches, they become lighter; in this condition they lay better, and their eggs will also hatch better.

Duck Houses.—In raising ducks a comfortable house should be provided for them, having a good sized yard attached, to which, if practicable, access should be had to a small body of water. An expensive house need not be made; any little low house will do for ducks, which should be kept clean and well ventilated, and supplied with fine hay as a bedding. A successful breeder of ducks says: "We have known a flock of ten breeding ducks to have been well kept in a house eight feet square and three or four feet high, with a yard ten feet long. They were, of course, allowed their liberty during the day, after they had laid their morning's supply of eggs." This would, of course, be very limited quarters for a flock of ducks of this size, but ducks can be reared with much less house room than is required for hens. Facilities for keeping a good supply of drinking water constantly on hand should be made in a duck house; also feeding troughs the same as for hens.



TOULOUSE GEESE.
Owned by J. Y. Bicknell, Buffalo, N. Y.



WHITE CHINA GEESE.

GEESE.

GEESE have been domesticated for ages, having been held in great favor with the ancient Eyptians, as is evidenced by their being frequently seen in their hieroglyphics. As an article of food they are more highly esteemed in the Old World than on this continent, where the turkey seems to take the first place among poultry. The flesh of the goose is, however, highly valued in this country, and has a peculiarly rich flavor, although more oily than the turkey or barn-fowl. There are fewer varieties of the domestic goose than most of the other breeds of domestic fowls; the principal being the Toulouse, Embden, Chinese, African, Egyptian, while we have also the Sebastopol, or frizzled goose, and several wild varieties which are readily tamed, among the best of which are the American or Canadian goose and the Grayleg of Europe. There is also the variety known as the Bean Goose, which is easily domesticated, the Gambrian, Barnacle, etc., of the wild species.

Geese will live to a great age, — an age entirely out of proportion to the brief time required for them to reach maturity. Birds of forty years of age are reported, while a recent writer mentions a venerable "grandmother goose" of sixty years of age, still hale and active. A work on poultry mentions a goose that at the time of writing was forty years old, still laying yearly her clutch of eggs, and bringing forth a fine brood of goslings, while geese of twenty years of age are by no means rare. Great numbers of geese are raised in Holland and some portions of England and France. In the migration of wild geese, they almost always retain the V-shaped ranks unbroken, being guided by their leader, who keeps up a peculiar call as his phalanx follow him through the air. There are few, if any, birds that mature so fast, which makes them profitable to raise, while their principal food being grass, little expense is required in raising them.

Toulouse Geese. — These are the two largest geese known; they are very compact in body, dignified in carriage, quiet and gentle in disposition. When three years old and well fattened, they will frequently weigh forty-five to fifty pounds per pair, sometimes reaching as high as sixty pounds per pair. They will lay from thirty to forty eggs in a season, and seldom sit. Their feathers are valuable, of which they will yield about half a pound at one "picking." The goslings are more hardy than the common variety, and grow very rapidly, frequently weighing, when four or five weeks old, from six to eight pounds each, and at three months, from fifteen to eighteen pounds. They require no food but pasturage, except in winter. In color the geese and ganders are alike, but can be distinguished by the form and voice, the gander being taller and more upright than the goose, while they have larger necks, a higher-keyed voice, and gobble in more rapid tones than the goose, which has a low, deep voice. The color of the plumage of the head and neck is dark-gray, that of the breast and body light-gray shading to a white under the body. The wings are dark-gray or brown; tail gray and white, the ends of the feathers being tipped with white; color of bill and feet a reddish-orange. The quality of flesh is good.

Embden Geese. — Among the varieties of domesticated geese, the Embden is regarded by many as the most valuable. The body is large, broad, and deep; the neck rather long and carried quite upright; head rather large, with large, bright-blue eyes; bill of medium size and length and flesh-colored. The color of the plumage is pure white throughout; legs orange-colored. In size they are nearly that of the Toulouse. They are hardy, early layers, and frequently raise two broods in a single season. The eggs are large, with a rough, thick shell, and white in color. Like the Toulouse, they will not commence laying until a year old.

Chinese Geese. — There are two varieties of Chinese geese, the white and the brown. The former are in plumage pure white throughout, with orange-colored legs and bill, and a large orange knob at the base of the bill. They are large in size, with long slender necks gracefully curved, which gives them a swan-like appearance. A great peculiarity of this breed is the great difference in size between the males and females, the former being nearly a third larger than the latter. They are an ornamental fowl, hardy, easily raised, and an excellent table fowl. They are prolific in eggs, which are of a small size compared with the size of the fowl, and sometimes rear three broods in a single season. The brown variety have rather a large, long head, dark-brown or black bill, with a black knob at its base; color of plumage grayish-brown, darker on the back, wings, head, and back of the neck than other portions of the body; legs dark, or dusky-orange in color.

African Geese. — Birds of this breed are quite large, and have one peculiar characteristic, which consists of a large black knob at the base of the upper mandible, and a heavy dewlap under the throat; for which reason they are known in some sections as the "Brown Knobbed Goose." Early importations are said to have attained the weight of fifty-six pounds per pair. They are somewhat rare in this country, but are really a valuable variety. The color of the plumage is mainly dark-gray, the front part of the neck and under portions of the body being light-gray. Bill black; legs dark-orange. They are nocturnal in habit, excellent layers, and the flesh of the young birds is of fine texture and flavor.

The Canada, or Wild Goose. — This is a native of the United States and Canada. It breeds in the far North, spends the spring and autumn in the temperate regions, and goes to the South, even to the Gulf of Mexico, in the winter, going North again towards the approach of spring. Wilson was of the opinion that the range of the Canada goose "extended to the utmost polar point, and the silent desolation of unknown countries, shut out from the prying eye of man by everlasting and insuperable barriers of ice." Its curious habit of flight and peculiar cry are familiar to every one. This bird is large in size, being about the weight of the Gray Leg goose. It has a long, slender neck, which gives it something of the appearance of a swan. The head, bill, and a large portion of the neck are black, with a white band about the throat. The feathers on the back and upper part of the body are a brownish-gray with light edges, which shades through light-gray to white on the under part.

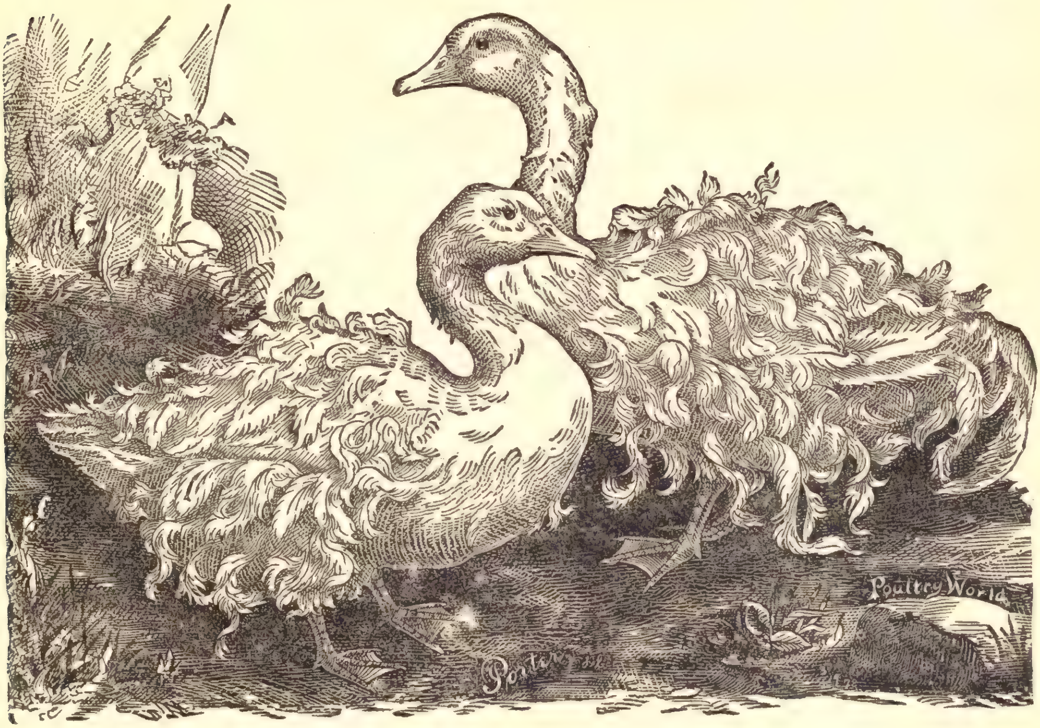
The wing quills and tail are nearly black, the legs are dusky color, nearly black. It is easily domesticated, and is said to be the most sagacious of any of the goose tribe. When hatched from eggs of the wild bird, they often become thoroughly domesticated in the first generation. It breeds freely with the other varieties of geese, and when domesticated retains much of the game flavor of the wild fowl.

Egyptian Geese. — This variety of fowl is noted for its beautiful plumage and stately carriage. It is sometimes called the Nile Goose, and extends from Alexandria to the Cape of Good Hope, and is frequently seen in England in a wild state. It is quite rare in this country, and is said to be a poor breeder. The head is of medium size and rather long, black and gray in color, with a chestnut patch around the eyes, which are of an orange color; the bill is of medium size and length, purple or bluish-red in color; neck rather small and of medium length. The back is narrow, curving from the base of the neck to the tail; body long and slender. The color of the plumage of the neck is gray and black; that of the breast partially gray, being of a chestnut color at the center; the upper portion of the body is gray and black, the under portion a pale buff or yellow, evenly penciled with black lines. The wings are white at the shoulders, with a narrow black stripe of metallic lustre, and the primaries and secondaries a glossy black. On the wing joints are strong, white, horny spurs about five-eighths of an inch long, instead of the hard knobs which most of the varieties of

EMBDEN GEESE.

geese have. The tail feathers are black, the thighs pale buff in plumage, and the legs a reddish yellow.

The Sebastopol Goose.— This is a very peculiar variety derived from the region from which it takes its name, and sometimes called the Danubian Goose, it being quite common in the region of the Danube. In form it resembles the common goose, the peculiarity being in the plumage which seems to grow the wrong way, like that of the Frizzled Fowl. The plumage is pure white, and from the tail and saddle they have long trailing feathers which are beautifully curved, while they are so thin in the quill that the least breeze blows them about, and are said "to look as though they were hatched in a gale of wind." The average weight of these birds is about ten pounds each. They breed freely with common geese, and the progeny generally show the peculiar plumage in a modified form.



SEBASTOPOL GEESE.

General Management of Geese.—The raising of geese is a very simple process, and may be made quite profitable where there are the proper surroundings and facilities. They may be raised with only sufficient water for drink, but it is better for them to have access to water in the form of ponds, streams, marsh, swamp, or sea-shore estuary, if practicable. There is usually one gander to three or four geese, but some breeders prefer them in pairs, as the male guards the nest during the incubating season, while the goose is off feeding. The gander is best for breeding purposes after his second year, and he will remain in full vigor for several seasons. Old geese make better mothers than young ones. When first commencing to lay, geese are apt to be irregular, but when more mature they will lay regularly, and yield a litter of from fifteen to twenty eggs before inclining to sit. The average number of eggs laid by geese in a year is from forty to forty-five, but they occasionally lay from sixty to seventy. This number is, however, not common.

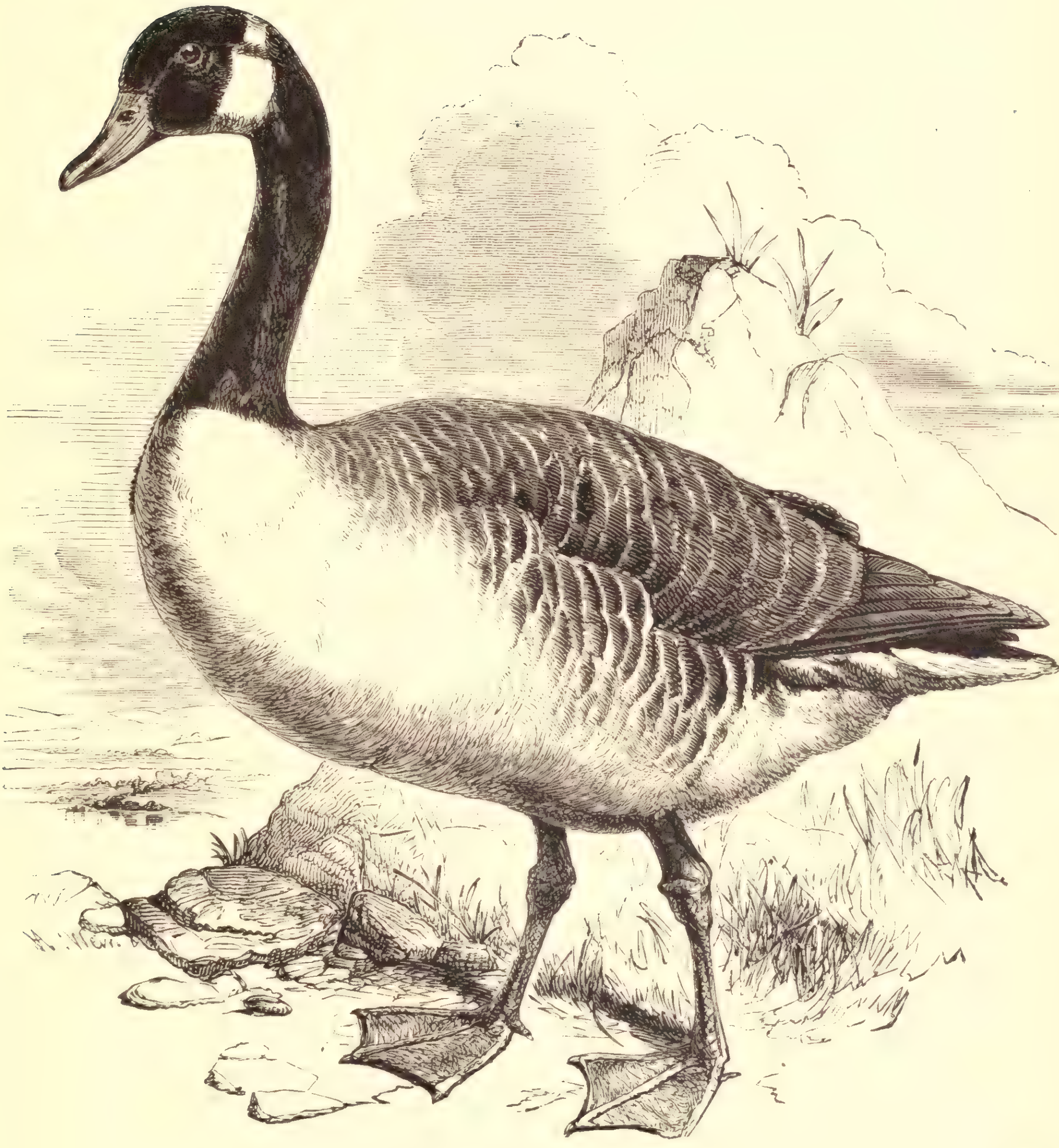
Breeding geese should be kept rather thin in flesh, and have a free grass range. When broody, the goose will remain upon her nest after laying. She should have a deep nest, oval in form, and from thirteen to fifteen eggs to sit upon. She will hatch in from twenty-eight to thirty days, according to the warmth of the season, and should be left unmolested, except that she should have food and water near her nest, for if left to gather her own food, she will be liable to leave the nest too long and allow the eggs to become chilled. The season for hatching is from April to July, although goslings hatched as late as September will winter fairly well. Newly hatched goslings, like ducks and chickens, do not require food for the first twenty-four hours. They should be fed with hard boiled eggs, chopped fine, for a few days, together with stale bread, soaked in milk, scalded meal, boiled potatoes, tender grass and lettuce, etc. They should be kept away from the water for two weeks, and when hatched early in the season should be housed in a dry, warm place, until they are strong enough to run about well.

They should not be allowed access to a body of water until two or three weeks old, the down on their bodies, when first hatched, not being a sufficient protection from the chill that

"ONE WAY OF PLAYING THE OLD GAME OF FOX AND GEESE."

would be thus occasioned. They should be regularly housed at night, and be fed for several days at morning and night with soft food, like scalded meal and bran, or mashed boiled potatoes. Young goslings should be well protected from the rain, and never allowed to wander in the wet grass. Geese are great foragers, besides, where they can obtain an abundance of grass this will form more than half of their food during the summer and early autumn. They require grass as much as cattle, and should have this in abundance.

Most breeds are apt to be rather noisy, and hence it is best to confine them in a fenced field or pasture that contains a marsh or stream of water. They will pick up considerable food from such ground. Old geese are apt to be very pugnacious when they have goslings, and will often destroy young ducks, chickens, or turkeys, with a stroke of their strong bill. They should therefore have quarters removed from other poultry, to obviate such danger. Geese are peculiarly inquisitive birds,—a trait which the above cut well represents. Rats will devour young goslings or other young poultry, if they have the opportunity and are plentiful in the immediate vicinity of the goose-pen. The fox is also an enemy to the goose tribe, as well as the skunk, weasel, and musk rat, and will be attracted from a long distance in the night to quarters where they are kept. The building where geese are sheltered at night, or sit, should therefore be well protected against their intrusion.



CANADA GOOSE.

The house for geese should be similar to that for ducks, and need not be necessarily expensive, but should be warm and dry. Many breeders prefer to sit the eggs of geese under hens. In such cases the goslings may be turned into the field by themselves at four weeks old, but should be looked after and be given shelter at night, or when there is a storm. After this age they may be fed with scalded meal, cracked corn, boiled vegetables, and vegetable or apple parings, but should always have access to an abundance of fresh grass. In winter they should have a variety of food, consisting of boiled vegetables, corn, and other grain, meat scraps, oyster shells, turnips sliced thin, cabbage, etc. When properly cared for, geese will generally have no diseases whatever.

Fattening Geese.—Geese are excellent table fowls, if taken when they are in their best condition, which is when they are ten or twelve months old. An *old* goose cannot be called a toothsome diet. They will fatten more readily if allowed good foraging ground, and fed from the time of hatching all through the season. For fattening, the best corn meal and potatoes, boiled together to a thin mush, is as good food as can be given them; they should have this three times a day in quantity all they will eat, and in about two weeks they will be ready for market.

THE OLD WORLD AND THE NEW.

SWANS.

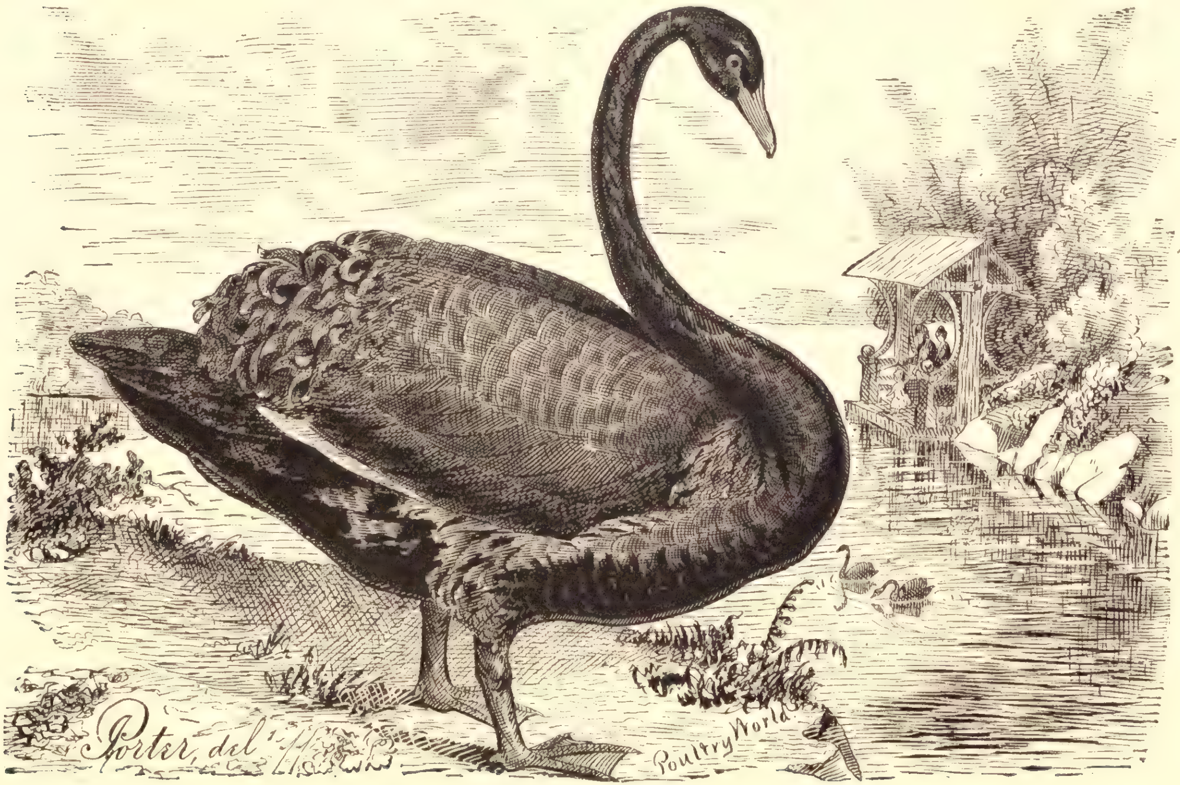
LIKE wild geese and ducks, swans have a wide range, being found in all regions but those lying in the torrid zone. Writers mention at least two species that are common to both Europe and America, besides others more local in their character. Mr. Wright says of these birds: "Every race (we believe without exception) is naturally migratory in its habits, though many individuals will remain, especially in the more temperate regions, in the same localities throughout the year, only taking short flights to and fro. In emigration they assume more or less constantly the V-shaped phalanx, which thus seems common to all aquatic birds. Their powers of flight are considerable when once fairly raised in the air, but the rising appears to be difficult and awkward. They almost always, if not invariably, rise from the water, striking down with both wings and feet, and thus proceeding, half flying and half splashing, for some twenty or thirty yards before they can fairly raise themselves; after which, however, they frequently attain a great height, Franklin stating that he has seen them in the Polar regions several thousand feet above the earth. They always descend, also, into the water, approaching it in a slanting direction, and stretching out their broad, webbed feet to check their speed at the moment they enter the familiar element.

Swans generally pair for life, their whole behavior offering a beautiful example of conjugal fidelity. The two birds show the greatest affection for each other, always swimming in company, and caressing each other with their bills and necks, in the most interesting manner; and should either be attacked, the other will show fight in the most vigorous manner, though of course the male is the most powerful and courageous. Both birds help to prepare the nest, the male chiefly getting the materials, while the female seems to take the chief part in the actual construction. A swan's nest is an enormous affair, being built up of a large mass of coarse water plants as a foundation, which is lined with fine grasses. In this, six to nine eggs are generally laid, which are, of course, very thick in the shell, and generally of a dirty white color, sometimes dirty pale green.

The time of incubation has been differently stated, but we believe Bechstein to be right in fixing it at thirty-five days, though some have said forty-two. The young, when hatched, are very thickly covered with down, and are generally taken to the water by the mother when only a day or two old. There they are watched over by both parents with the greatest care until grown enough to provide for themselves." We know of a pair of swans in a park of one of our large cities, a few years since, that exhibited the greatest affection for each other. After a time the female sickened and died. The male drooped for a time, and was finally found dead one morning, evidently having pined himself to death over the loss of his mate. There are in all about ten species of swans known, most of which are pure white in plumage. The flesh is not good except when the birds are young. They are the most graceful upon the water of all aquatic fowls, and are a rare ornament to either public or private parks.

The Mute Swan.—This is a native of Northern Asia and Europe, and is one of the largest and most graceful of all the swan species. The neck is long and slender, the bill red, and the protuberance at the base black; the legs and feet a dark brown or gray. The plumage is pure white throughout.

This bird is not mute, as its name would indicate, but has a very soft, low voice, somewhat melancholy in tone. The cygnets, or young swans, when first hatched, and for some time after, are gray, and may be frequently seen on the back of one of the parents when they are swimming in the water. There is another large white swan, closely resembling this



BLACK SWAN.

species, and sometimes mistaken for it, known also as the Polish swan, the young of which are pure white when first hatched.

The Whistling Swan.—This bird is called by naturalists *Cygnis musicus* (musical swan); it is somewhat smaller than the Mute Swan, and its neck is shorter and thicker. It has a pure white plumage, yellow bill, which lacks the protuberance of the latter mentioned species. Different writers, in describing this species, all mention the peculiar musical qualities of its voice. Faber says: "Their tuneful, melancholy voices sound like trumpets heard at a distance." Olaf writes: "When a company of these birds passes through the air, their song is truly delightful, equal to the notes of a violin;" while Schilling

THE MUTE SWAN.

describes the tone as sometimes resembling the sound of a bell, and sometimes that of some wind instrument. He says: "This peculiar concert realized to my mind the truth of what I had heard concerning the song of the swan, which I had before regarded as a poetic fiction."

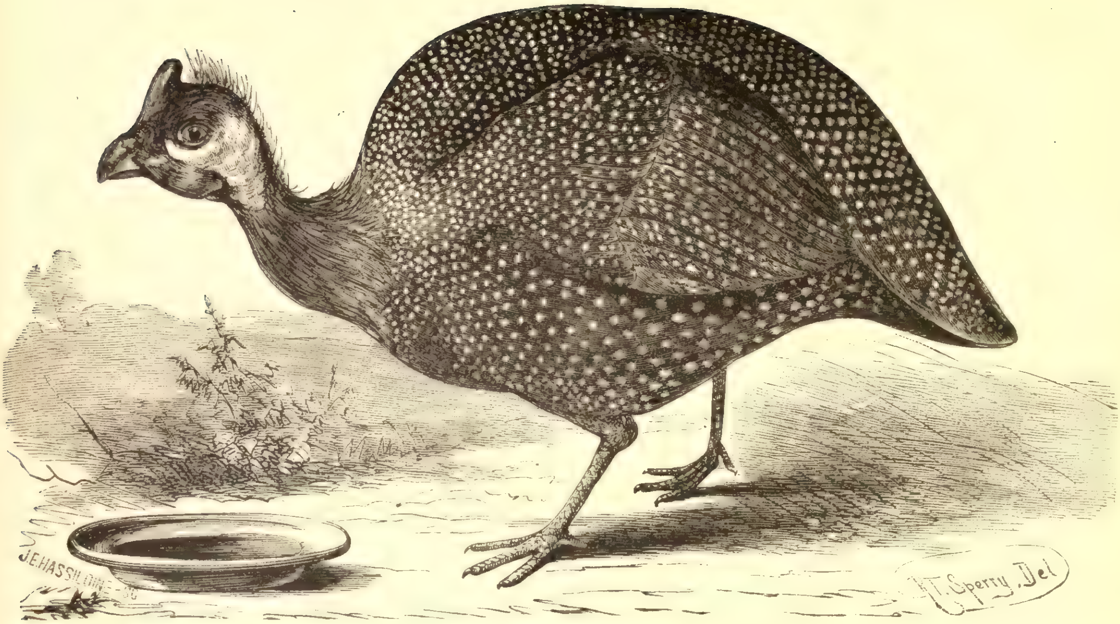
The Black Swan is a native of Australia, and, next to the Mute Swan, is one of the most common varieties. It is smaller than the latter, although resembling it in general outline. The plumage is black, shading on some of the feathers to a dark gray; eyes, scarlet; bill, red tipped with white; legs, black. The young are quite hardy. This species is said to be not as gentle in disposition as the Mute Swan, and inclined to be tyrannical and domineering over smaller water fowls.

Black-Necked Swan.—This species is a native of South America, and is sometimes known as the Chilian Swan. The plumage of these birds is snow white, except the head and neck, which are jet black, all but a narrow streak of white across the eyes. The bill is lead color, with red protuberance; legs, reddish orange. In swimming, this bird carries its neck erect, more like the goose, and not curved like most of the other species of swan.

Management of Swans.—These birds should be provided with shelter near the edge of the water, to which they can have easy access. A small house will answer the purpose, suitable provision being made for nests and feeding. They are powerful birds, guarding their nests and young with zealous care, and will not tolerate any interference

BLACK-NECKED SWAN.

during the season of incubation. But little can be done except to provide food and proper shelter, unless the birds have been previously made quite tame. When petted and frequently handled, they can be made very tame, swimming a long distance to feed from the hand. Their food should consist principally of grain, a variety being as necessary as for other birds. If the young swan are wild when hatched, soaked cracker or bread may be thrown to them upon the water; but if the old birds have been thoroughly domesticated, the young will be apt to be quite tame. Swan's eggs may be hatched under geese or large ducks, in which case they may be brought up quite tame.



GUINEA HEN.

MALE PINTADO, OR GUINEA FOWL.

GUINEA FOWLS.

THERE are many varieties of the Guinea fowl, all of which are supposed to have originated in Africa. Among the many races of this bird some have a peculiar bony-like helmet on the top of the head, while others have in its place a crest of feathers, which varies more or less in different varieties. The most common varieties are those with a plumage of dull black or dark bluish gray, finely dotted with white, and those of pure white plumage. Guinea fowls are very useful where there are many enemies to poultry, such as hawks, crows, rats, etc., as they are ever on the alert for danger, and give the alarm in a loud, shrill cry. An extensive poultry keeper says of them:

"To any one keeping a large number of hens a pair of Guineas is a good investment. I know from experience that they will and do keep the hawks away. We live right under the mountain (a favorite haunt of the hawks), but as long as our Guineas sun themselves on the barn and exercise their vocal powers in the yards, the hawks prefer to swoop down upon the defenseless poultry yards of neighbors or lie in wait for unlucky rabbits.

Once when our Guineas had a brood of young I saw the hen rise on wing and chase a yellow-eyed monster who had designs on her young family. We have for several years past lost but one chicken by the hawks."

They are prolific layers during the summer season, but their eggs, though small, are rich in flavor, and fully make up in numbers what is lacking in size. The flesh of these fowls is relished by those who are partial to a gamy flavor and dark meat. The principal objection to these birds seems to be in the noise they make, as they keep up a screeching, disagreeable sound; also in the difficulty of rearing the young chicks, which, when first hatched, are very tender. They are apt to be pugnacious and domineering over other fowls when permitted to mix with them, and quite inclined to steal their nests away, by which means many of their eggs are liable to be lost.

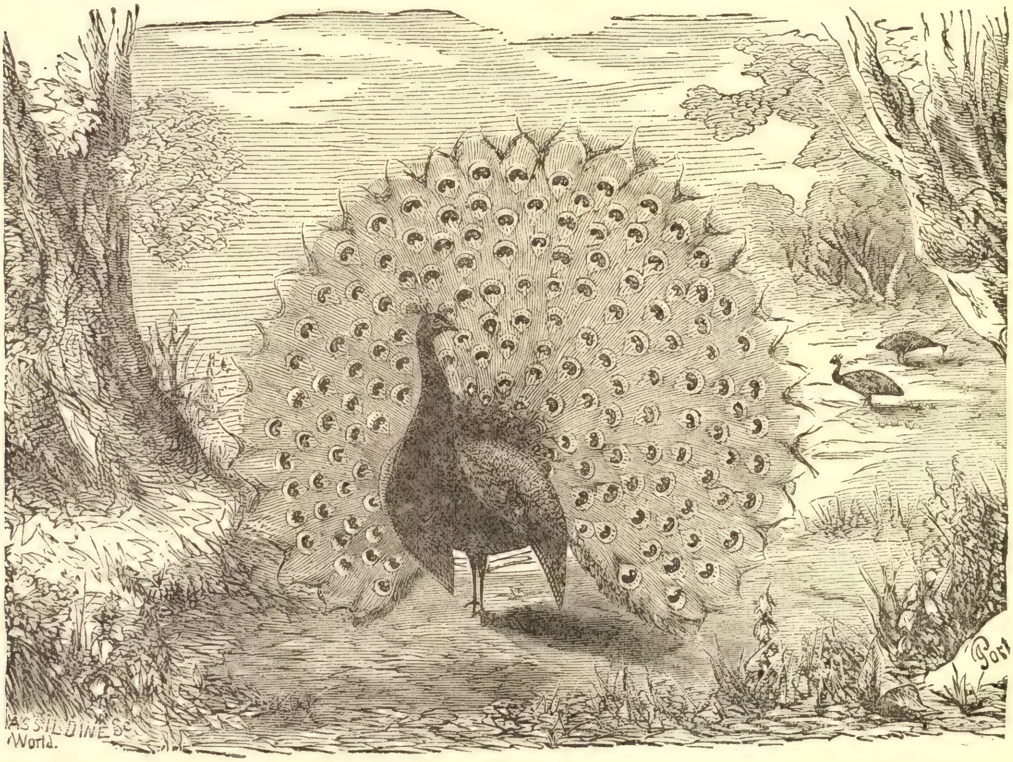
Management of Guinea Fowls.—Although long domesticated, Guinea fowls still seem to retain much of their wild nature, the young chicks when hatched being quite wild; but, when kindly treated and often fed, these birds will become sufficiently tame to eat from the hand, and will not wander far from home. They usually commence to lay in June. The eggs have a thick shell, which is about the color of that of the Brahma, but quite speckled. When set under a hen, they require a month's sitting. The chicks, when first hatched, are very tender, and continue to be so until they change their coat of soft down for one of feathers. After this critical period they seem quite hardy, and will, in a great measure, take care of themselves. They are very pretty little creatures, of a dun color, and remind one of young partridges. A breeder of these fowls says:

"The first one I reared was an odd egg put under a hen for an experiment, early in the spring. The hen hatched twelve chickens, and then kept on sitting till the Guinea chick was hatched. (I did not then know how long the chicken would be coming from the shell). After it was hatched I put it with some young chickens two days old, and it grew and flourished, eating the same as the chickens. What seemed to me very strange was that when fifteen more little Guineas hatched, the first one would never stay with them, but made a shrill whistle till I put it with the chickens, when it would seem perfectly happy; and to this day, although ten months old, it prefers to be with its foster brothers and sisters rather than with the Guinea hens. This shows how tame the birds may become."

It also shows how easily they can be trained to run with the hens, and when so reared they will not be as apt to quarrel with them. Young Guinea fowls should be fed and managed generally the same as young turkeys. These fowls, like turkeys, will be inclined to seek high roosts, such as trees and the top of sheds, but should never be permitted to do so. They should be provided with shelter and roosts, the same as barnyard poultry.

THE PEA FOWL.

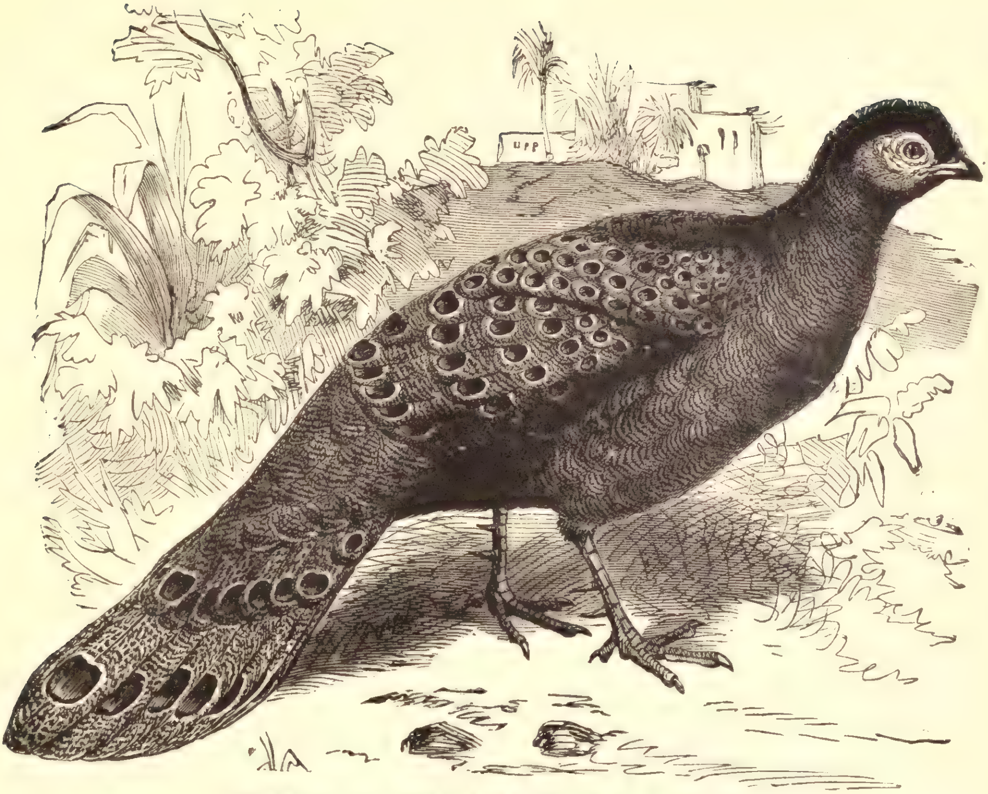
EASTERN ASIA seems to be the original home of this beautiful bird, from which region it has been widely disseminated throughout a large portion of the globe, and so well known that it scarcely requires a description. The plumage of the head, neck, and breast of the male is a beautiful purple, with blue reflections; that of the back green, with copper-colored lacing; the wings a mincing of white, black, blue, bronze, and gold tints. The tail coverts are a glossy green, with bronzy golden reflections, ocellated at the tips. The neck is long and slender, and the head small in proportion to the size of the body; it is surmounted with a small crest of twenty-four feathers, which are webbed only at the tips, and have green and blue reflections. The Pea hen is less gaudy in her attire, the prevailing color being chestnut brown, which is shaded and mottled in different parts of the



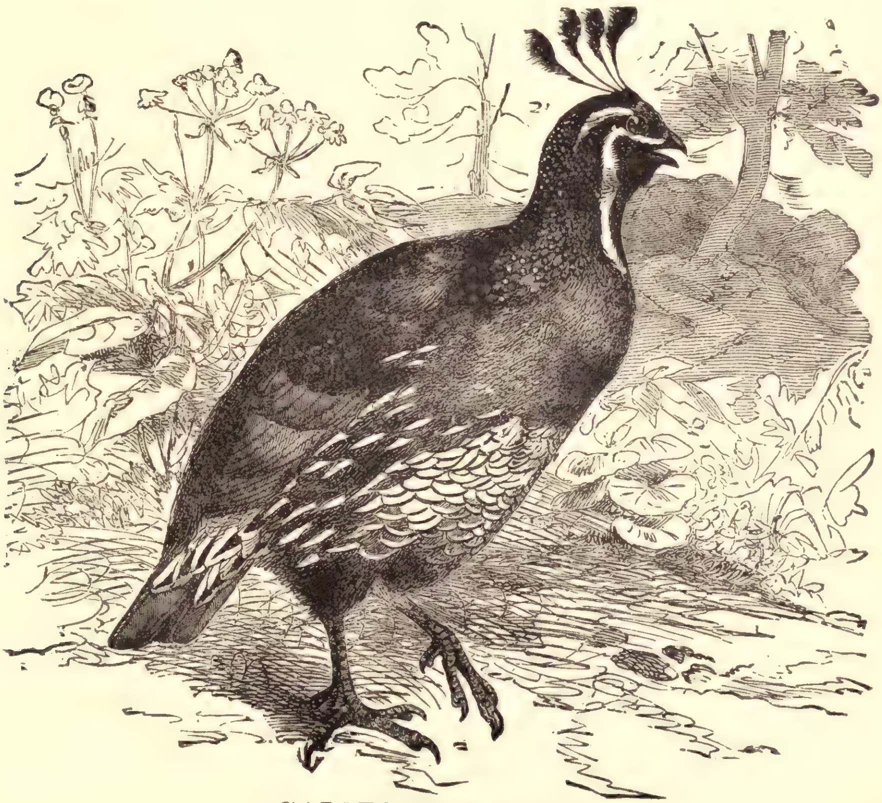
PEACOCK.

body. Her crest is much smaller than that of the male. The Japanese peacock is more gorgeous in plumage even than the former variety, the reflections being exceedingly rich, and consisting of a strange blending of glossy green, purple, blue, and coppery or bronzy gold. White peacocks are sometimes seen, but are not as desirable as the colored, since they are greatly inferior in beauty, and are also less hardy.

Management of the Pea Fowl.—Mr. Wright gives the following general directions for managing these birds: "Little can be said about their management; they must be left to a great extent to themselves. One cock should not be allowed more than four or five hens, and they should be regularly fed. The hens lay their eggs in the most secluded place they can find,—somewhere deep in a copse or shrubbery in general, though some will take to the long grass in an open field,—and must *on no account* be disturbed. They are so impatient of their privacy being invaded that such an event is nearly always followed by 'soft eggs,' or if sitting at the time, with failure; but if left to themselves they will almost always bring off



PEACOCK PHEASANT OF ASSAM.

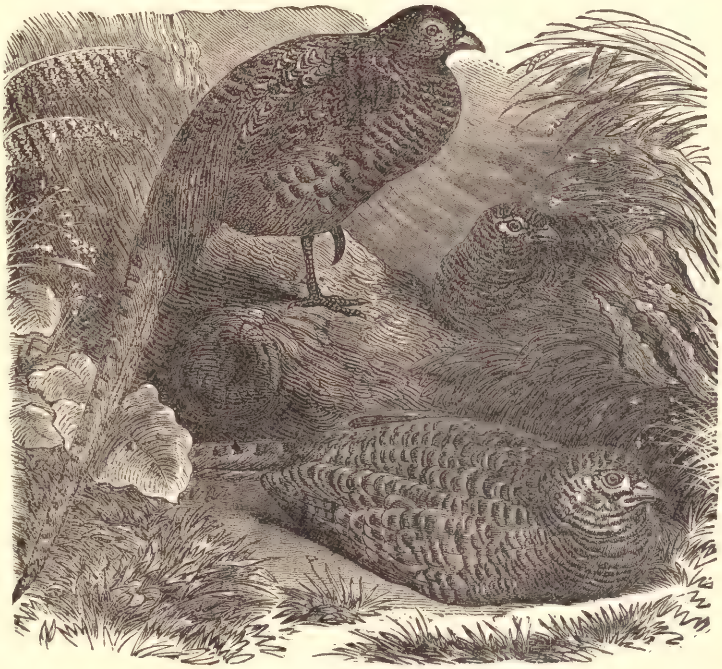


CALIFORNIA QUAIL.

regular and good broods. When hatched the chicks should be treated very much as young turkeys, except giving them more animal food. They are not, however, so delicate as turkeys, and in fine weather they should always be let out, but only on short grass. After a fortnight they need very little care indeed.

The peahen goes with her chicks about six months, or even till next spring, and is a very fond mother. The young appear to need this extended protection, and hence it is almost useless to attempt to hatch the eggs under common hens, which discard their brood at two months, unless artificial mothers are provided to nourish them afterward. Till they moult at eighteen months old, the cocks remain the same color as the hens, and do not get their plumes in full beauty till their third year. Both sexes moult very fast, and appear to suffer much during the process, always seeking the deepest seclusion at such times. It is, however, rapidly over if all goes well, though the new train of feathers seem to remain very short for some little time, when they appear to take a fresh start and rapidly assume their former length."

The scream of the peacock is very tiresome and disagreeable, and the bird is generally very quarrelsome with other poultry, sometimes even eating young chickens. It likes to roost on the ridge of houses and in trees, but is apt to get frost-bitten in cold weather in such exposed places.


ENGLISH PHEASANTS.

Pheasants and Quails.—The pheasant is a gallinaceous bird of the family *Phasianidæ*, and has been domesticated in many portions of both Europe and America for several years. When well fattened, the common pheasant attains the weight of about five pounds; the quality of the meat is excellent, possessing a very delicate flavor. They are quite hardy, and easily reared, requiring about the same care as chickens. A beautiful variety known as the Peacock Pheasant is classed by naturalists between the peacock and the pheasant. The plumage of this bird resembles that of the peacock, each feather on the back and in the tail having a beautiful ocellus, or eye with greenish and blue reflections, like the latter. These birds are quite rare. Quails are beginning to be domesticated to a limited extent, and although sometimes when hatched by a hen they will seek their wild companions after remaining several months with their foster mother, if they have the opportunity, when kept in confinement the enterprise has proved quite a success. The quail feeds upon all kinds of grains and insects, and sometimes grapes, but is content with but a small quantity of the latter, while it destroys vast numbers of the chinch bug and other insects, and the good accomplished by this bird in this respect many times compensates for the small loss in the grape product from the vineyards. The objection, therefore, that is sometimes urged against the Valley Quail in California is not well founded. When domesticated, they should have the same care as chickens.

PIGEONS.

THE numerous varieties of domesticated pigeons, amounting to more than two hundred and fifty, are supposed by naturalists to have descended from the common wild pigeon so well known and widely distributed over both continents. This great diversity from one common ancestory shows what can be accomplished in the art of breeding with a specific object in view. Pigeons make beautiful pets for children or older members of the household, and are an attractive and pleasing adjunct to the surroundings of a country or city home. They require but little care, and well repay for their keeping. Fancy pigeons are divided into two classes, viz.: the "high class" and the "toys." Some of the principal among those recognized as belonging to the former, are the Pouters, Tumblers, Almond, Short-faced Carriers, and Barbs, while the leading toy varieties are the Trumpeters, Fantails, Long-faced Tumblers, Helmets, Quakers, Priests, Turbits, Jacobins, Magpies, Swallows, English Owls, Nuns, Archangels, Antwerp Carriers, etc.

As to which varieties are the most desirable for breeding will depend much upon the taste of the breeder, since each variety differs very essentially from every other, and individual tastes differ so widely. The varieties which are perhaps the most popular generally are the Pouters, Carriers, Short-faced, Fantails, Jacobins, although there are many others that may be equally desirable.

Pouters.—There are five varieties of Pouters, viz.: the blue-pied, black-pied, red-pied, yellow-pied, and white. They are very attractive birds when well bred, and possess one very peculiar characteristic, which consists of being able to distend or blow up what seems to be an immense crop, which gives them a very singular appearance,—hence the name pouters, or as they are also sometimes called, "blowers." They have a very upright carriage, tapering bodies, and long legs. These birds will become very tame when kindly treated, and seem to love to be petted.

Short-faced Tumblers.—There are a dozen or more varieties of the Short-faced Tumblers, of which the standard colors are Almond, Kite, Mottles in Yellow and Red, Agate Mottles in Yellow and Red, whole feathers in Yellow and Red, Dun, Grizzle, Blue, etc. This class of pigeons derive their name originally from the habit of turning a somersault backward in the air during flight. This propensity seems to be partially voluntary and again involuntary, or caused by some special excitement; as the bird has a short plump body, small head, and short wings and tail, the weight of the body would more easily turn it over than if the wings and tail were more lengthy. There are the Short-faced and Long-faced Tumblers; the latter are generally the birds that perform these somersaults best, although some of the short-faced varieties will compete with them in this respect. The Almond is the most popular variety. Tumblers are regarded by many as the most intelligent of all the pigeon race; they have a broad, high head, which has a prominent rise from the base of the neck, which is very short. They are beautiful in form and plumage, have a round, dignified carriage, and are active, but quiet in habit.

A breeder of these birds describes the plumage of the leading varieties as follows: "In Almonds, bright buff, intermixed with black and white throughout the entire bird, each

feather showing as near the three colors as possible. Kites should show a fiery glow throughout, and when held to the light with wings exposed, it presents a very deep mahogany shade of color, the deeper the better. Mottles should have rose or white mottling only on wings and not over the entire covert, a slight ticking of white through neck and head; tail some color other than white, the flight also same as body color. Agates run lighter in both flights and tail. Many are sometimes surprised in the change of a young Agate, expecting it to be a fine whole feather, but after the first moult it has entirely changed. The breeding of the Short-faced Tumblers is a sort of lottery, as no man can tell what such a bird will breed, neither can he say with certainty what color the young will really be until after it has moulted its nest feathers.

To be successful in rearing young birds, a supply of nurses or feeders must first be had, say two pair or more to each of Short-face, so that some will be nesting the same time as your Tumblers, to give you an opportunity to shift either eggs or young, and supply the Short-face with the feeders young, as it does not matter if they would not feed them over a week (as is generally the case), and by letting them do this you save your valuable birds. The best nurses for a Short-face are good Plain-face Balds; some use Turbits and do well with them, but as long as I can get the Bald-head I can ask for nothing that suits my wants better. I have tried other varieties and know from past experience."

Carriers. — There are four well known varieties of the carrier pigeon, black, blue, dun, and white, although we occasionally see the red, and some others less common. These birds have a form suited to rapid and extended flight, some of them performing almost incredible feats in aerial journeys. The body is long, with flights and tail long in comparison with the size of the bird, the shoulders wide, standing well out and on a horizontal line with the front of the breast; the thighs long, and strong, and muscular. This bird has two peculiar characteristics which give it a very singular appearance, viz., an immense beak, wattle, and a wide wattle around the eye. These fancy points frequently in aged birds make them unsightly objects. Before the days of steam navigation, railroad and telegraphic communication, the carrier pigeon was an important agent in the rapid delivery of important messages, its love of home and attachment to its mate and offspring having imparted the capability of training these birds for this purpose. On long distances, the birds are selected, if possible, that have young ones in their nests. The average rate of speed in these birds is about thirty miles an hour, although better records are frequently given, that of the noted and champion bird "Columbia" having been two hundred and thirty-seven miles in four hours and fifty-eight minutes. He also flew from Columbus, Ohio, to Hudson City, New Jersey, a distance of four hundred and seventy miles, air line, leaving Columbus at fifteen minutes past five o'clock in the morning, and reaching his home at eight o'clock on the following morning. Making due allowance for resting (since he could not fly during the night), this achievement makes Columbus the champion of the United States, having flown the longest distance in the shortest time. Although somewhat weary from his long flight, the first thing Columbus did on reaching his coop on that morning, was to seek his mate and caress her. Then he went for food, water, and the bath tub.

Barbs. — The Barb pigeon is supposed to have derived its name from an abbreviation of Barbary pigeon, since it was first introduced from that country. Its original color was either black or dun, although there were birds of both these colors. They are now found black, white, red, yellow, and blue. The head markings are the most distinctive features of this bird. The head should be large, broad across the top, the eye pearl, surrounded by a circular eye-wattle of a coral red color; beak short. The form of the bird should be a short neck widening towards the shoulders; breast broad; body plump; legs short. These birds

are quite hardy, are quiet in disposition, and not addicted to extensive wanderings when well cared for at home.

Trumpeters. — The note from which the Trumpeter derives its name is a kind of prolonged coo, somewhat resembling the sound of a trumpet in the distance; this is one of the essential characteristics of the bird, but the power of voice and frequency of this vocal exercise varies with different birds. There are several varieties, black, white, red mottled, black mottled, etc. They are beautiful and showy birds, having what is known as a crest or rose formed of feathers that protrudes in front of the head, and much resembles a rose in full bloom, the feathers forming the petals. When fully developed or developed in perfection, this rose hides the eyes of the bird, from a front view, and shows only the tip of the bill. A crown of feathers extends from ear to ear, turning upwards, which somewhat resembles a hood. The legs and feet are profusely feathered.

Priests. — There are four or more varieties of these birds, blue, black, red, and yellow being the most common. The head extending from a little below the bill is white, while the feathers at the base are turned up the same as in all crested pigeons, the remaining part of the plumage being red or black, etc., as the case may be.

Turbits. — The colored varieties of Turbits are numerous, comprising black, red, yellow, blue, silver, dun checkered, blue with white bars, creamy, etc. Each of these colors is also bred as tail and wing Turbits, four styles of heads being recognized, viz., shell, point, peaked, and plain head, thus making the Turbit family a very extensive one. The peak crest is perhaps the most fashionable, and the hardest to get in perfection, yet the shell, point, and plain breeds are more common, and may be regarded as equally beautiful. "A shell crown should be of a perfect segment of a circle of upturned, inverted feathers, springing from the base of the skull below the ears, rising well up to a sharp, even line; clear and regular, and of about one inch in length. In all other respects, shell-crowned Turbits possess the same general properties, though the point crest is preferred." The color of the plumage in wing Turbits is represented by the color of the shoulder, the remainder of the plumage being pure white, while tail Turbits should have the tail correspond in color with the shoulder marking.

Jacobins. — The Jacobin pigeon derives its name from a French order of monks that wore hoods to cover their bald crowns. It has a range or ruff of feathers inverted around the neck from the wing buts, and extending up over the head in the form of a hood. The more compact and close-fitting the hood is, the more they are prized by fanciers. They are bred in plumage of red, yellow, black, blue, and white, and are quite common.

Fantails. — These beautiful birds have been bred very extensively in the past, and are at present great favorites, they being one of the most desirable of the fancy breeds. As the name indicates, they derive their appellation from the size and form of the tail, and the quivering or trembling of their necks. One strain of Fantails is quite large and erect, with very large tails, another is smaller and more stylish in form. They also vary in form, some birds having quite long necks, others being quite short-necked. The latter is the German variety. The pure white variety is the most common, although there are also the blue, silver, black, yellow, saddle backs, and frizzled. The yellow and blue varieties are quite rare. There is also the pure white with a slight purplish glimmer about the neck, which is very conspicuous when the bird is in the sunlight; there are occasionally seen black birds with a white tail, and white with black tails; but the pure white are the most beautiful. They cannot fly well, and stay about the yards and dove-cote more than any other breed.

Mr. J. M. Rutted says, in the *Poultry Monthly*, respecting this variety of pigeons:—

"The ideal Fantail of competent judges is a plain-headed pigeon uniting perfect 'Scotch' style and a typical 'English' tail. Few fanciers know how peculiarly difficult is the production of such a combination. *Fine* white smooth-head Fantails are one of the scarcest varieties of pigeons I know of. In an experience of over nine years, I have seen about a dozen which had a fair claim to being first-class, and I have made it my business to see every noted bird within reasonable distance, besides numerous visits to exhibitions. The most necessary point of the breed is a *short back*. Many breeders will differ from this, and put *tail* first, but unless the tail is carried squarely upright, no matter what its size, it never shows to any advantage, and a *lop*-tailed Fan is often beaten in the show-pen by a short-backed bird with half the

WHITE FANTAIL PIGEON.

spread. Next in turn comes *spread* of tail, and *not* tail 'count.' Twenty-four feathers flatly expanded and forming three-quarters of a circle are much more valuable than thirty-six in that narrow 'stove-pipe' shape so much detested by veteran fanciers. And the actual *money* value of the former would be twice that of the latter, which fact may interest some pigeon keepers who look at the 'profits' only. Third in importance is *carriage*, *style*, *action*, or whatever term you are pleased to apply to continuous nervous motion, a well-expanded breast, a neat head and neck thrown well back and down to the root of the tail, and a succession of elegant curving outlines best described by that most significant word 'symmetry.' The feet and shanks as far as the knee-joint should be bright red and free from feather, but the best often have a few scattered tufts, showing that the Booted Fantail of India was probably one

of their ancestors. Wings must be carried easily below the tail and touching at the tips. If held up closely they spoil the shape of the tail by bending the lower feathers out of line, and as this fault is very hereditary, a Fantail so marred should not be used unless of necessity. The wing butts should be concealed by the small body feathers, and the whole feathering as tight as careful breeding combined with good condition can produce. Young birds do not have such graceful carriage of head and neck as their parents, being inclined to stand too erect, but with age fine-bred Fans, as a rule, gradually acquire the desired outlines.

The head, beak, and feet must be fine in shape and small sized. No Fantail coarse in these three points can possibly look high-bred. In mating for breeding I should use a good Scotch male of the most approved form and motion, with a tail well filled in the centre, and carried right up to its head. He should be clean footed and close feathered, but a good *spread* must not be expected, such stock, to the best of my belief, not being for sale. The hen must be chosen chiefly for shape, size, and fitness of *tail*, in which she ought to be especially fine to offset the deficiences of her mate. As *shape*, good or bad, is very hereditary, the most of their young will be apt to have the graceful bearing of the sire, and one or two may possess fairly excellent tails also.

The best young cock may be bred next season with his mother, and in this way, there will be a fair prospect of breeding in one bird a grand *spread* and the desired *style* of the first Scotch cock. This system has resulted successfully in my own loft, and can be tried again by any fancier fortunate enough to get the required stock, in getting which all the difficulty lies. Fantails should not be bred so small as to have neither constitution nor tail. On the other hand, they must not be too large, since they are not judged by "size and weight." In keeping up a strain which will annually produce a large average of fine young, a most rigid system of selection and mating is necessary." These birds are very affectionate, and love to be petted.

Other Varieties of Pigeons. — The limits of this department will not admit of the description of an extended variety of pigeons; we will, therefore, add briefly but a few others to those already given. THE MAGPIE pigeon derives its name from its close resemblance to the bird of that name. It is bred in blue, black, yellow, and red colors, some of the varieties being very handsome. THE SWALLOWS are characterized by a skull cap and heavily-feathered feet and legs. Their points of marking are as follows: "First, the head; the upper mandible should be dark and the lower light; the scalp or top of the head in a line from the corners of the mouth across the eye, evenly marked, passing around to the back of the head, dark, but in those that are turned-crowned, the head must be perfectly white. Secondly: The wings of these should be wholly colored, without any white feathers, but the epaulets or scapular feathers which lie on the back, at the junction of the wing to the body, should be quite white, and as they overlay a part of the wing when closed, it necessarily appears narrow, which is considered a particular point. Thirdly: The feet, if shod, should be thickly covered with colored feathers from the heel or nack-joint to the toes; but the boots, or as Cochin fanciers would style it, the vulture-hock, must be white."

There are, in all, nine sub-varieties of this class of birds. THE OWL pigeon is closely allied to the Turbit, and derives its name from the form of its bill, which resembles that of an owl. The three classes of this variety are the English, the African or Foreign, and the Whiskered Owl. The English is the largest and most hardy. The Whiskered Owl derives its name from an extra development of frill, which consists of another frill crossing the one extending up the centre of the breast, and extending from side to side until it nearly meets behind the neck of the bird. The frill is one of the important points in these birds, and consists of tufts of feathers extending from the back to the lower part of the breast, and resembles the ruffle of the old-fashioned shirts worn by our ancestors in revolutionary times. In birds that are perfectly formed, this should be widely and evenly developed.

The feathers on the breast open and turn both ways, expanding something like the petals of a rose; this is called by some purle, and by others the frill, and the more the bird has of it, the better. These birds are apt to be a little wild, like the Carrier, and off their nests if disturbed while sitting; for this reason it is well to have the breeding places made so that they can have a secluded place for sitting.

The Nun is so called from its peculiar markings, the body always being pure white, with the head, tail, and flights of some solid color, such as black, red, yellow, or blue, they being generally preferred in the order given. The Archangel seems to differ in plumage from any other variety of pigeons; the head, neck, breast, and body, with the exception of the wings, are a rich copper color, while the tail and wings are a rich bronze black, the metallic

THE OWL PIGEON.

lustre reflecting in the sunlight the most gorgeous and beautiful tints. The Antwerps are noted for their homing characteristics, and for long and rapid flights.

Management of Pigeons.—Pigeons make beautiful pets, and may be kept with but comparatively little trouble. They differ very essentially from other domestic birds in respect to breeding, since as many different varieties as are desired may be kept together in one loft without danger of crossing, provided they have all been properly mated before being put in together. The foundation of success with pigeons, as with other feathered pets, is in strict attention to cleanliness. If the droppings are allowed to accumulate in the loft, the odor arising from them will be very injurious to the birds, causing them to become diseased; the filth also gets between the toes and on the feet of the birds, producing cracks and sores,

which in time will destroy the appearance and value of the birds. The floor of the pigeon loft should therefore be frequently cleaned and kept well sanded. Keeping dishes of water set about on the floor of the loft is also objectionable, for the birds wet their feet in the water and then track about over the droppings, which adhere to their feet, or else they upset the water and make the place wet. Pure, fresh water should always be kept by them in watering tanks of such a construction that they cannot be easily overturned. Pigeons drink early and often, and unless provided with a good supply of clean water will not thrive. A breeder of pigeons gives the following advice with respect to the food:

"In the matter of feeding, great care should be exercised, and only what food the birds will eat up clean and with an apparent appetite should be given. Sloppy food should never be given. When feeding moistened meal, or scalded meal, do not feed in such quantities that a lot is left on the floor, to heat and to cause the production of worms and insects innumerable. When feeding moistened food, it is best to use a small, shallow, wooden trough, from which the pigeons can readily take the food.

Almost all kinds of grain are relished by pigeons, such as wheat, rye, oats, barley, buckwheat, etc., while whole corn, though it is best not to feed too often or in large quantities, is much liked. Stale bread, moistened in fresh milk, is one of the best kinds of food for pigeons, keeping them looking sleek and glossy, while those breeds which are so short-billed or soft-billed as to eat whole grain with difficulty can readily eat this food. Lettuce is something of which pigeons are very fond. It should be hung up where they can peck at it at will, and should be freshly gathered daily for them. When possible, those who have the ground to do so should keep a supply growing all the year round, in the hot beds and cold frames, and the family as well as the pigeons can enjoy it. By keeping the birds tame, which every true fancier will do, there is no trouble in catching any of them when necessary, while they thrive far better than when kept wild."

Always give good, sound grain, and when corn is fed it should be that of some small-kerneled variety. Vetches or tares, small white pease, turnip seed, and millet are also good food for pigeons. Occasionally, though sparingly, hemp seed may be given. They should have finely-broken oyster shells kept by them at all times. Some breeders recommend that a large lump of rock salt be kept in the loft where they can have access to it, and which should occasionally be immersed in water for a moment or two and then left in its usual place. It is a good plan to have the nest boxes large enough to make two nests side by side in one box, since they frequently commence laying again before the young birds are ready to leave the nest. Tobacco stems make excellent material for building their nests, as they aid in exterminating vermin. Sulphur strewn in their nests is also excellent for the same purpose.

which in time will destroy the appearance and value of the birds. The floor of the pigeon loft should therefore be frequently cleaned and kept well sanded. Keeping dishes of water set about on the floor of the loft is also objectionable, for the birds wet their feet in the water and then track about over the droppings, which adhere to their feet, or else they upset the water and make the place wet. Pure, fresh water should always be kept by them in watering tanks of such a construction that they cannot be easily overturned. Pigeons drink early and often, and unless provided with a good supply of clean water will not thrive. A breeder of pigeons gives the following advice with respect to the food:

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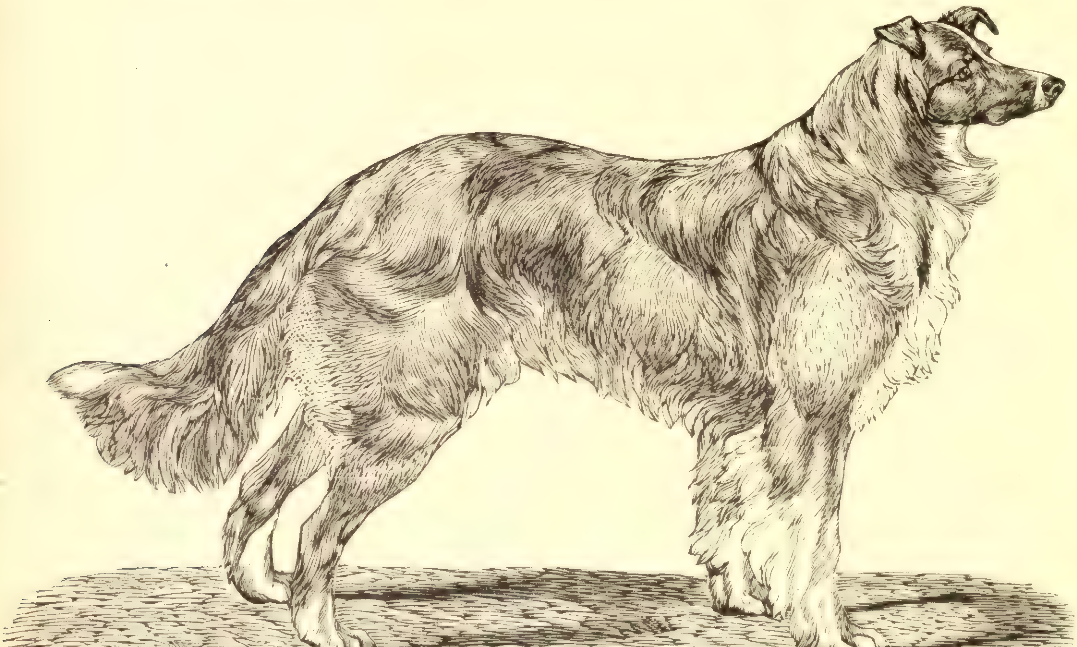
Imported Rough-Coated Scotch Collie, "CHAMPION TWEED 2d."



Champion "LASS O' GOWRIE."

Both animals owned by T. H. Terry, New York City.

DOGS.

THE dog belongs to a family that is widely distributed over nearly every portion of the globe, and is thought by many to have been the first animal ever domesticated by man. However this may be, we have no positive proof as to the fact. There is, however, abundant evidence to show that the dog existed in a domesticated state in prehistoric times, and we have no definite knowledge respecting its origin. It is supposed by some that all our present breeds of dogs have been derived from a single source, such as the wolf or jackal; others that they are the product of a blending and crossing of several distinct species, some of which may be living, others extinct. Others, still, regard them as the descendants of an extinct wild species. The most prevalent opinion entertained at the present day, however, is that the dog is the product of the crossing of several distinct species of animals. This opinion is based upon the fact of the many distinct breeds of dogs in the earliest historic period, these breeds so widely differing from each other, yet closely resembling wild animals of other species; the Esquimaux dogs, for instance, which closely resemble the wolf of that region in general appearance and voice; also the existence of wild species of dogs in all portions of the world, the fondness of man in a savage state for taming wild animals, etc. It is well known that even the most savage and degraded tribes of the human race all have dogs, and, notwithstanding they are often cruelly and brutally treated, they always entertain to a certain extent an attachment for their master and submission to his will that characterizes dogs bred by the more intelligent and civilized races of mankind. The dogs of savages, however, are lacking in that intelligence, faithfulness, and other desirable qualities that the improved and well-trained dogs of enlightened people possess, which shows that, like mankind, the dog is capable of a higher education, and that its intellectual and nobler qualities may be developed to an astonishing degree. The dog is universally conceded to be the most intelligent of the brute creation, and has long been the companion as well as faithful servant of man. Like the human kind, the dog is subject to all the varying passions, such as anger, jealousy, envy, hatred, love, and grief; while he also sympathizes with his master in joy or sorrow, is quick to anticipate his wants, and shows gratitude, pride, generosity, love of praise, fear, often a remarkable memory, and the exercise of those faculties which in man would be called reasoning powers, and which cannot, as is usually the case, be justly attributed merely to what is termed "instinct."

A certain French writer has said that "the best part of a man is the dog there is in him." It is certainly true that if, according to their intelligence, mankind were as faithful in the performance of duty as an intelligent and well educated dog, there would be less of deception, treachery, and evil of every form in the world than there is at present. Some one who evidently lacked a certain element of character essential to a just appreciation of what was noble in a dog, has said that "the best treatment for a dog was to cut off his tail behind his ears," a sentiment in which we cannot concur; and we doubt if there could be found many among the intelligent and thinking class of people that would endorse such an opinion, except as it were applied to the worse than useless curs that are so common in the country, and which have been such a nuisance to farmers in connection with sheep raising. A story is told of the faithfulness of a dog at the Mill River disaster that occurred at Williamsburg, Mass., several years ago, and which brought desolation and death to so many homes. A person who visited the scene of the disaster a few days after it occurred says:

"I shall never forget a scene I witnessed there during the search for bodies. The driftwood and *débris* had made a deposit beside a tree nearly twenty feet in depth, and there I saw a large dog crying pitifully. As we drew near we found that the dog was fastened down

by a stick of timber, and unable to move. His eyes were like balls of fire, and he was fearfully emaciated. At first we feared to go near him, but finally released him, and gave him some food. He dropped the food, looking down and whining.

'Some one is here,' one of our company said, and we commenced digging, and while doing so the dog lay very quiet; but the moment we ceased he seemed to grow almost frantic. When we commenced digging he laid down again, but no effort would induce him to taste the food before him. At last, after hours of labor, we found the body of an old man, and a little later a little boy, over which the faithful dog had been keeping watch. The joy of the poor brute was great, but the food which he had so generously refused would never be eaten by his young master.

'This story interested me greatly,' said my friend, 'for I knew the dear little boy who went out with his faithful dog to the meadows that dreadful morning, and the kind old man, his grandfather, who, hearing that the terrible flood was coming, went out to seek him.' They were all swept away; but the marvel was, how they kept together during that fearful four miles, and how the poor dog should know they were buried deep below him."

A good dog is a valuable servant and faithful friend, and deserving of the kindest treatment and consideration of his master. Dr. Holland has beautifully illustrated this idea in the following poem addressed to his dog.

TO MY DOG "BLANCO."

My dear, dumb friend, low lying there
  A willing vassal at my feet,
Glad partner of my home and fare,
  My shadow in the street.

I look into your great brown eyes,
  Where love and loyal homage shine,
And wonder where the difference lies
  Between your soul and mine!

For all of good that I have found
  Within myself or human kind,
Hath royally informed and crowned
  Your gentle heart and mind.

I scan the whole broad earth around
  For that one heart which, leal and true,
Bears friendship without end or bound,
  And find the prize in you.

I trust you as I trust the stars;
  Nor cruel loss, nor scoff of pride,
Nor beggary, nor dungeon bars,
  Can move you from my side!

As patient under injury
  As any Christian saint of old,
As gentle as a lamb with me,
  But with your brothers bold;

More playful than a frolic boy,
  More watchful than a sentinel,
By day and night your constant joy
  To guard and please me well.

I clasp your head upon my breast—
  The while you whine and lick my hand—
And thus our friendship is confessed,
  And thus we understand!

Ah, Blanco! Did I worship God
  As truly as you worship me,
Or follow where my Master trod
  With your humility,

Did I sit fondly at His feet,
  As you, dear Blanco, sit at mine,
And watch Him with a love as sweet,
  My life would grow divine!

The great naturalist, Cuvier, regards the domestic dog as "the most useful conquest that man has gained in the animal world." It matters not whether his master be rich or poor, each individual dog defends his person and his goods, tracks him through the crowded street, distinguishes his voice from all others, and remains his faithful servant and companion even unto death; not from constant fear or necessity, but simply from true gratitude and affection. Instances are not uncommon where at the death of his master the dog refuses to be consoled, pines, and finally dies of grief. The dog is also the only animal capable of defending his master against other animals, or enemies of any kind, while he guards his

flocks and home, performing the duties of shepherd, drover, sportsman, and protector, remaining at all times his sagacious and faithful friend.

Varieties of Dogs.—The varieties of domestic dogs are very numerous, and as they are formed by crossing, there is scarcely any limit to the number that might be produced. According to Professor Fitzinger there are at least one hundred and eighty-nine distinct varieties of dogs. Considerable difference of opinion exists with regard to the method of grouping the different varieties, some depending to a certain extent upon the development of the ears, others upon the formation of the head, the length of the muzzle, etc. Thus dogs having the head, and especially the muzzle lengthened may constitute one group or class, such as the Greyhound, the Italian Greyhound, the Scottish and Irish Deer Hounds, the Albanian Hound, etc. Second, those having the head and muzzle less elongated than the former, which class comprises the most useful and intelligent of the whole race of dogs, such as the Scotch Collie or Shepherd Dog, Hound, Spaniel, Setter, Pointer, Newfoundland, and St. Bernard. Third, all those having the muzzle shortened, and the top of the head elevated, which class includes the Terrier, Bull Dog, Mastiff, and Pug Dogs.

Other classifications may be made according to the peculiar characteristics of the varieties: thus the Shepherd or Collie Dog belongs to the Spaniel class, remarkable for intelligence, sagacity, and affectionate attachment to its master. The Mastiff and other large, short-tailed dogs noted for their strength and courage may also constitute a class by themselves; while those noted for fleetness, such as the Greyhound, Deerhound, Foxhound, Bloodhound, etc., constitute another class, and so on. The most common class of dogs at the present time is the mongrel race known as Curs, which belong to no particular breed, but are the result of chance crosses. Although an occasional good animal may be found among these nondescripts, they are, as a general rule, practically worthless, and too frequently a common nuisance to farmers, being addicted to sheep killing and other dog vices, which would render their extermination a blessing as well as a necessity in some localities.

Dogs may be grouped, for convenience, into four classes, viz.: Watch Dogs, or those that are kept to guard property, such as the Mastiff, St. Bernard, Newfoundland, Shepherd, Drover's Dog, and the Bull Terrier; sporting or field dogs, such as the Pointers and Setters; dogs of chase, including those that follow the game by scent or sight, such as the different varieties of the hound; pet and toy dogs, such as the Black-and-tan Terrier, Scotch, Yorkshire and Skye Terrier, the Italian Greyhound, King Charles Spaniel, Poodle, Pug, etc.

Dogs Useful to the Farmer.—A good dog is of great value on the farm, and may be taught to be serviceable in many ways. We believe every farmer should own a dog, one possessing the most desirable qualities for the position, the same as any other farm animal, or help on the farm. In other words, dogs should be thoroughbred, like other valuable farm animals. When the useless curs so commonly seen in the country are exterminated, and well bred and well trained dogs are permitted to take their places, there will be less complaint among farmers about not being able to raise sheep on account of such nuisances, and no necessity of instituting dog laws for sheep protection, since the dog will then be an assistant to the farmer in guarding and caring for his flocks, instead of making ravages upon them. What would the shepherds of Scotland do without their faithful Collies? The Ettrick Shepherd avers that "the whole of the open mountainous land of Scotland would not be worth a sixpence without them."

Every breed is more or less valuable, from the Shepherd Dog who faithfully performs his duties to his master's flock, the shaggy Esquimaux that draws the sledge over long and weary roads, the Newfoundland that is a protector as well as a rescuer of life, the dignified Mastiff, the sagacious and intelligent St. Bernard, that guards the house and its surroundings from all intruders, the Pointer and Setter that are of such valuable service in securing

game, down to the little diminutive and ever active Terriers that rid the premises of rats and other vermin, and always give the shrill bark at night if there is any danger from intruders, and thus are among the best of Watch Dogs for signaling danger,—all possess desirable qualities of greater or less value to their master, and for the respective positions to which they are adapted, will prove valuable servants.

A good dog for the farm should be a faithful watcher, to guard the premises night and day; he should be kind in disposition, obedient, gentle to the farm stock, intelligent so as to understand what is required of him, and know his master's stock and premises, and also a good ratter, as well as an exterminator of foxes, skunks, weasels, etc. The dog that combines these qualities in the most satisfactory degree will prove the most useful to the farmer. As to which of the valuable breeds are the most useful on the farm, opinions differ. Many prefer the Scottish Collie.

A gentleman in Canada says on the subject: "I am satisfied that no breed of dog is so useful on the farm as a pure Collie. The breed we have will bring the cows home to be milked and drive them back to pasture; find the sheep and bring them to their enclosure every evening; is remarkably fond of children, but does not like cats. We live some two miles from a post-office, and on mail day our Collie will go and bring the papers and letters just as safely as any man would do it. We have a harness for him; it goes around the neck and fastens around the body, with a pocket on either side, having a flap buckled over. Then he gets on his brass collar with pointed edges, as a protection from other dogs on the road, very few of which will come near this dress. Before starting he has a lunch, and is promised a good dinner if smart back. About twenty minutes is the time he takes to do the message, unless delayed at the office, where he announces his arrival with a loud bark. In the busy time of spring and harvest, this letter-carrier proves a great advantage."

Some have a decided preference for the Mastiff. A writer in N. Y. gives his opinion as follows: "I have had some experience in the line of useful dogs, and am decidedly in favor of the Mastiff. The mastiff is a noble looking animal, large, kind, very affectionate, and not inclined to wander about the country miles from home. He is intelligent and very domestic, and as a rule is fond of children. I have one at the present time, a little over a year old. He is a very large and powerful dog, but my little six-year-old girl controls him perfectly, and when on the street he always seems to take delight in guarding her from danger, taking the outside or more exposed position. She has taught him to shake hands, sit on a chair, lie down, roll over, play 'possum, fetch and carry, and his extreme good nature is remarkable. Still he has courage, and if a strange dog comes near the child, or approaches the house, he must retreat at once or take a shaking up. We vote for the Mastiff."

Dr. A. S. Heath, in a paper read before The Farmer's Club in N. Y., expresses his preference in favor of the Fox Terrier. He says: "The Fox Terrier is a small dog, weighing from eighteen to twenty-five pounds. He is active, intelligent, kind, vigilant, obedient, cleanly, honest, faithful, healthy, and capable of performing his work in the most satisfactory manner. No stray animal can invade the premises with impunity day or night. Every unusual noise must be accounted for. The derangements of the house and barns are learned by him and reported by him in a business way. Foxes, skunks, rats, weasels, minks, stray cats, and all other marauders are expelled from the premises on the pain of death. In a word, I regard the Fox Terrier as the most suitable dog for the farm."

In our opinion, although some other breeds may prove very valuable for all practical purposes on the farm, the Scotch Collie has no equal is this respect, especially when well trained to assist in caring for the stock.

The Mastiff.—This is a noble breed of dogs, although the pure-blooded animals are quite rare, probably owing to their great size and the consequent expense of keeping; also to the fact that modern safeguards for the protection of property have rendered them less

essential than formerly. The English mastiff belongs to a race of great antiquity. More than three hundred years ago Conrad Herebatch, a writer of that time, described him as—"Neither too gentle, nor too curst; that he neither faune upon a theefe, nor flew upon his friends; very waking; no gadder about, nor lavish of his mouth, barking without cause; neither maketh it any matter though he be not swift, for he is but to fight at home and give warning of the enemie." He is a fine looking animal, possessing the dignified bearing that reminds one of a lion, while he is docile, companionable, intelligent, and courageous, though not ferocious.

When crossed with the Newfoundland or Bloodhound, the offspring are apt to be ferocious; and when crossed with the bull-dog, they are often exceedingly savage and dangerous brutes. The points of the mastiff are as follows: Head large in size, in shape between that of the bloodhound and bull-dog, having the volume of muscle of the latter, with the flews and muzzle of the former, though not as deep; ears small in size, drooping like those of the hound. The teeth usually meet, but there is generally a slight projection of the lower jaw; eye rather small or medium in size; the loins are compact and powerful, limbs strong, coat smooth; the most desirable color is red or fawn, with black muzzle; the tail is but slightly rough, and carried high over the back when under excitement; voice very deep and sonorous; height about twenty-eight to thirty-two inches. There are many smooth-haired dogs of large size that are frequently erroneously called mastiffs, but which are only mongrels, possessing, perhaps, some mastiff blood.

The Newfoundland.—There are three classes or varieties of the Newfoundland dog considered pure, all of which were originally natives of Newfoundland, viz.: the true Newfoundland, the large, long-haired variety, commonly known as the Large Labrador, and the smaller variety, known as the St. John's or Lesser Labrador breed. In intelligence the three breeds are regarded as being about equal, all being celebrated for their faculty of being easily taught to fetch and carry things. This is frequently developed to a surprising degree. A friend of the writer had a dog of this breed that once returned two or three miles on the road to find a whip that had been lost at the commencement of a journey. Anything that has been handled by the master will be found by these dogs simply by the scent, they having sufficient intelligence to understand what is required of them when it has once been pointed out.

NEWFOUNDLAND DOG.

Both the large and small varieties are good water dogs, but the larger, having a more woolly coat, can best endure the wet and cold. They are known to have rescued many persons from drowning, their natural instinct for carrying being exceedingly valuable under such circumstances. They can swim with great speed, their large legs and feet enabling them to paddle with considerable force. One of the characteristic points of the true Newfoundland is great size, dogs of this breed often attaining the height of from twenty-eight to thirty inches, while they have been known to reach even thirty-four inches. An English writer gives a description of this breed as follows:

"The head of a Newfoundland is remarkably grand and full of character, while its expres-

sion is very benevolent. Across the eyes the skull is very broad, and he has a large brain. The forehead is frequently wrinkled; the eyes are small, but bright and intelligent; they are generally deeply set, but should not have a blood-shot appearance. The ears must be small, smooth, set low, and hanging close; they are very seldom set up, even when the animal is excited. Nose and nostrils large; muzzle long and quite smooth; mouth capacious; teeth level. The neck is naturally short. It is well clothed with muscle, as are the arms, legs, and forehand; but there is a slackness about the loin, which accounts for his slouching and somewhat slovenly carriage.

He is frequently short in his back ribs, and some of the largest dogs have a tendency to weakness in the back. The feet are long and strong, but the sole is not so thick as that of a well-bred pointer, nor are the toes so much arched as in the average of hunting dogs. This peculiar structure of the foot is adapted for his sledge work on snow, and accounts for his power in the water, and has given rise to the vulgar error that he is 'semipalmated.'. The shaggy-coated Newfoundland has a smooth face, but within two inches of the skull the coat suddenly elongates, and, except that he is very clean to the angle of his neck, he is thoroughly feathered in his outline. His coat generally parts down the back, and this parting is continued to the end of the tail, which is bushy and carried very gaily. His hind legs are closely coated from the hock, and his feet all round are nearly as free of feathers as a cat's. The color is generally black; and a brown or brindled tinge is a valued characteristic of the true breed. The black and white is not considered as good." The neck has a ruff of hair, which also adds to its short appearance. There are many long-haired dogs improperly called Newfoundlands by persons not acquainted with the true characteristics of this breed, such dogs being only a mongrel race.

The *Large Labrador* has not so compact a frame as the true Newfoundland, being more loosely built, and the coat, which is never wholly black, but more or less mixed with white, is longer, more woolly, and curly.

The *St. John's Newfoundland* or *Smaller Labrador* is rarely more than twenty-five inches in height, and usually considerably less. The head is larger in proportion to the size of the body than the Large Labrador; the ear somewhat fuller; neck longer, the body much more compact, and the hair shorter, glossy, and devoid of woolly texture; the tail is similar, but the hair is less woolly; the legs and feet are strong, and well adapted for work. The color is usually jet black, reddish brown being rarely seen.

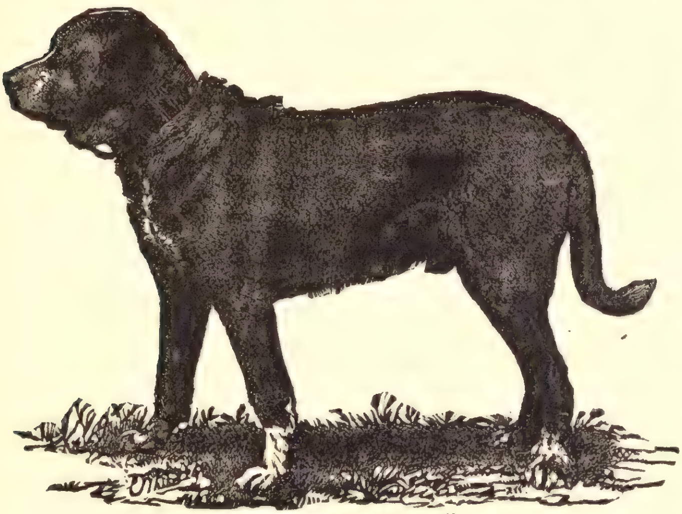
The St. Bernard.—This breed of dogs have long been world-wide famous for their intelligence and sagacity in tracking and aiding benumbed travelers in the snow, they being trained to carry provisions, wine, and clothing on these expeditions of search for those who may be lost or overtaken in the violent storms so common in the region of the Alpine hospice, kept by the monks of St. Bernard. The dog of this breed, known as the "Good Dog Barry," is said to have saved the lives of over forty persons. There are two varieties of the St. Bernard dog, one long-haired or rough-coated, and the other smooth, the two varieties being similar in all respects except the hair. Of the rough-coated varieties those of a deep tawny brindle, relieved by some white, are most preferred. The smooth-haired variety are red and white in color, or brindle and white, with frequently a peculiar broad white collar about the neck, the latter marking being regarded by many as characteristic of the purity of the breed.

It is said that about seventy years ago the number of St. Bernard dogs was greatly reduced at the Hospice, owing to several casualties, and the monks were obliged to employ the female dogs for the hard service of rescuing travelers, and in consequence came near losing the breed. They introduced at that time a cross of a large, rough-haired breed, supposed to be Newfoundland, and thus originated the rough-coated variety. The marks preferred by the monks are a black or dark head, a white muzzle, the white marking running up over the head, white breast and collar, white feet or "stockings," and the tail tipped with

white. The above markings of the head and neck are preferred by the monks because they resemble the badge of the monk's order. Solid colored dogs are not uncommon.

The St. Bernard dog is remarkably pleasant in disposition, and may be trusted with women and children with the greatest confidence, towards whom he seems to take the part of a self-appointed guardian. Their principal characteristics are a large head, majestic and intelligent appearance; eyes rather deep, with a furrow extending between them up to the skull; lips pendulous; general form well proportioned. The height is from twenty-eight to thirty-one inches; the length six feet, including the tail. They have a keen scent, unusual quickness of perception, and remarkable powers of endurance. The valuable dog "Monk," owned by Mr. D. P. Foster, of New York, and said to be the largest St. Bernard in the country, died a short time since. Mr. Foster says of him:

"I brought Monk from the monastery of St. Gothard, in Switzerland, last August. He cost me $500, but I have since refused $800 for him, and I valued him at $1,000. He weighed about 170 pounds, stood thirty-four inches from the shoulder to the ground, and measured six feet nine inches from his nose to the tip of his tail. He was two years old, of a tawny lion color, with large, lustrous, kindly, nazel eyes, a heavy, drooping jaw, and huge, overlapping upper lip. His frame was massive, and his face beamed with intelligence. When reared upon his hind feet he looked enormous and fierce, yet he had such a gentle and kindly nature that children delighted to play with him, and he with them. Every day I took him out into Washington Square for his airing, and he was a great favorite with the nurses and children, and would poke his nose into every baby carriage that came near. He was a pure, rough-coated St. Bernard. His father and mother are yet employed by the monks of St. Gothard in hunting the mountain passes in search of unfortunate travelers. They are named Jungfrau and Monk, and they distinguished themselves in 1871 by saving the lives of several of a large party of monks, guides, and travelers who were buried in an avalanche.



ST. BERNARD, "DON,"
Owned by Mr. John P. Haines, New York City.

He was a dog of exemplary behavior. No man could enter the house at night without his permission, and none could go out unless I was there to give my consent. He was obedient, would fetch and carry, shake hands, lie down for the children to play with him, and give his old mountain howl of distress if he wanted help. He would not go out in the street unaccompanied, and then only after his toilet had been properly made — his face washed and his hair combed. He understood simple commands in three languages — Latin, French, and English. If there was a noise at the front door, he would be the first there. If the bell rang in the night, he would come and wake me up by scratching at the door. Monk had one peculiarity; he did not like soldiers, and when he met one he would step back and crouch as if ready for a spring. The reason of it was that he had been struck when young by a soldier. He always seemed to remember that blow, the monks said, and I found it true. He always reminded me of the lines that I once saw on a picture of old Monk, his father:

'In joy and sorrow I am my master's friend,
Honest and faithful, bribeless to the end.'"

COLLIES.

COLLIES, commonly known as Shepherd dogs, also Scotch collies, are at present the most extensively bred of any of the canine family, which is probably due to their being the most useful dog generally to the farmer and ranchman in the assistance they render in the management of sheep and cattle, their intelligence, docility, and strong natural instincts for the care of stock, making their training for these duties a comparatively easy task; and having once learned what is required of them they never forget, but are faithful and untiring in its performance. To the shepherd in wild, mountainous localities, they are indispensable. In many portions of Europe, where large flocks of sheep are under the care of but one shepherd, they are often allowed by the aid of these dogs, to roam over vast territories, often in places so rough as to be inaccessible to man, yet these sagacious animals will follow them all day, and become so familiar with the members of their own flock, that they will not permit them to intermingle with other flocks that may be grazing in the same locality, but keep them entirely separate. It is not an uncommon occurrence to see a flock of sheep and goats in the mountains of Switzerland and Scotland under the entire care of dogs, who thus watch them during the day and drive them into the folds at night. Being so constantly with their master, and receiving such perfect training from him for their duties, has, according to the natural laws of transmitted characteristics, greatly increased the intelligence of this breed, which, combined with the care exercised in selecting the best specimens for perpetuating it, has vastly improved the collie, so that he now stands first in intelligence and sagacity among his race. In disposition he is docile and tractable, and always seems anxious to obey his master's orders, and will watch for every sign and gesture from him when he has once learned their meaning; in fact, he evidently takes pleasure in being useful, and although he may readily be taught to perform tricks for the amusement of spectators, he never seems to enjoy the sport, although he will do this to please his master, yet is apt to get sulky and show displeasure when required to repeat them many times, evidently regarding it as an imposition upon his dogship; but when called upon to serve his master in his own especial duties, he will be faithful unto death if necessary. The intelligence of these animals is truly astonishing, and the authentic anecdotes related of them often so wonderful as to seem incredible.

It is related of a Scotch shepherd who had in his charge seven or eight hundred sheep, that one night as he was quietly driving home his flock as usual, a terrific thunder-storm burst upon them, which so frightened these naturally timid creatures that a regular stampede was at once instituted, and away the whole flock went rushing and scampering back into the hills. It was too late to follow them, and if the disheartened shepherd could have done so, it would have been an impossibility for him to have restored order to so large a number and directed the flock homeward to the fold again. Not knowing what to do, the poor man turned to his favorite dog, and in his Scotch dialect said,—"Sirrah, they are awa!" In an instant the dog was off; it was so dark he could not tell which way he had gone, and as he did not return, the shepherd wandered about during the long hours of the night in the vain hope of being able to find the scattered portions of his disorderly flock; as dawn appeared, and the dog not returning, he decided to go at once and report the disaster to his master, when happening to look down into a valley near by he recognized, to his surprise and joy, his faithful "Sirrah" not with a portion only, but the entire flock, keeping them safely in charge. It is also related from authentic sources, that one of these dogs in England whose master was a cattle dealer, would drive a whole drove of cattle to a neighboring market unaided; and if he chanced to meet another drove on the road would so manage as to pass it without allowing his cattle to get mixed with the others. Another anecdote with respect to the collie, and one that seems almost past belief, is, that a sheep stealer in

Scotland had one of these dogs so well trained, that while walking among a flock of sheep he could designate by some sign the one he wished, and at night the dog would go into the fold and drive out that particular one to his master's flock.

The usual color of the collie is black and tan with a little or no white, but sometimes there is a deviation from this rule, some of the best dogs of this breed, and those that have often won high prizes at dog shows, having been a departure from this general rule, and are described in color as tawny red or tawny red and white, sable and tawny red, etc. The head of the pure collie is rather broad, the eye full, mild, and intelligent in expression, the ears pricked, small, and slightly falling at the tip. The body is well formed and finely proportioned. The coat consists of long, thick, woolly hair, which forms a complete protection against all vicissitudes of weather. The legs are of suitable size to well support the body. The tail is slightly curved and bushy, and is a very ornamental appendage to a truly handsome body, so that "all in all" our canine collie is not only one of the most useful, but also one of the most comely of his race. The illustrations which we give are presumably the best types of this breed in America, they being champion prize winners at both bench and field shows in this country, and having won numerous prizes in Europe before their importation, Tweed's prize winnings already amounting to over a thousand dollars. The color of Tweed 2d is black and tan with some white; that of Lass O'Gowrie tawny red and white. In order to improve the breed and training of collie dogs, and thus increasing their usefulness, field trials have been instituted within a few years, both in England and in this country, in which the intelligence and training of these dogs are tested in the management of sheep, where they are required to drive a small flock, usually strange sheep, into an enclosure for the purpose, strict time being kept, and the one that accomplishes this feat unaided in the shortest space of time is declared the winner. Sometimes the more difficult task of picking out his master's sheep from other flocks and driving them into the fold is given him to perform. We insert an account, from the *American Field*, of one of these trials that took place at Pittsburg, Pennsylvania, recently, in which Tweed 2d, the subject of our illustration, was winner.

"The trials commenced promptly Wednesday, at ten o'clock, sheep having been previously placed in the starting pen, five for each dog, and the route was laid out, from the starting pen down the track to near the quarter pole, where a turn was made, and the sheep driven back, past the starting point, and on around the track to a point opposite the quarter pole, when they were driven inside the field and penned in the folding pen, the entire route covering about one-half mile.

"Tweed 2d was called up first, and at the command from Mr. Phœbus, his handler, entered the pen and brought his five sheep out on the track, driving them over the route very leisurely, but securely. The sheep made several breaks, at one time running in opposite directions, but the champion showed himself to be master of the situation, and rounded them up in fine style, turned them into the open field, and got them safely to the pen, when fresh trouble commenced. He got two of them inside, when the others made a break across the ground, Tweed following them, and although he crippled himself in jumping a ditch, never faltered in his work until he got them back to the pen, when, as they still refused to enter, Mr. Phœbus called out, 'Speak to them,' and giving a short, sharp bark, the sheep quickly ran in and the gates were closed. Time, fourteen minutes and three seconds.

"Mr. Ralston's Jim was the next dog called. He started out very fairly, but his sheep becoming thoroughly demoralized, ran all over the grounds, and he failed to return with them, or pen them, which put him out of the race.

"Mr. Strean's Carlo came next, a fine looking dog, but laboring under the disadvantage of being entirely deaf, his handler working him entirely by hand signals. Taking his infirmity into consideration, this dog did very well, succeeding in penning his sheep in twenty-nine minutes and thirty seconds.

"Mr. Strean's Rover followed, and although he succeeded in bringing his charge safely to the folding pen, his handler was compelled to assist him in getting them to enter. He consumed over half an hour in performing his task.

"After dinner, Mr. Ralston's Waddie was called, a very handsome dog, but entirely new at the business he was called upon to perform. He was soon in deep water, and required the direct assistance of his handler to get his charge in shape again. He improved in his work as he progressed, but at the folding pen he again had to have help to make them enter. Time, eighteen minutes and four seconds.

"Dr. Downey's Scottish Maid came last, having to drive the same five sheep which had given so much trouble to Mr. Ralston's Jim in the forenoon. Taking into consideration the character of this flock, the Maid did by far the finest work of the trial. She was as quick as a flash, and her actions in handling her unruly charge called forth constant plaudits from the spectators. If the spectators had had the awarding of the prizes, she would have had first unanimously, and she would have won it any way if her sheep had acted as well as they did for the other dogs. As it was, she penned them in grand style in fourteen minutes and twenty-six seconds.

"The awards in the All-Aged class were as follows: First, Dr. J. W. Downey's Tweed 2d; second, Dr. J. W. Downey's Scottish Maid; third, Mr. J. G. Strean's Carlo."

The following account of a sheep dog's trial held at Darlington, Durham, England, as given by the *Darlington Times*, is also interesting in showing the sagacity of this breed of dogs, and the wonderful extent to which their training may be carried.

"This event was a source of considerable interest to visitors on Thursday, though the result was not satisfactory from a spectacular point of view. Five dogs were entered to compete, only three of them putting in an appearance. The trial consisted in turning four sheep out into the park at the lower end of the ground, the extent of which is probably three-quarters of a mile square, small plantations being studded here and there. A herd of cattle was also grazing in the park, which, as was proved in the course of the trials, somewhat increased the difficulties which the dogs had to overcome. In a circumference of about three-quarters of a mile blue banners were fixed, and the dogs had to drive the sheep around this circuit and pen them at the finish. At each side of the ring the flags were placed so near to the plantations that the space to be traversed by the sheep was narrowed to about the dimensions of a gate; and the rules prohibited the owner of the dog from going so near the animal as to be able to guide it, with his voice, or in any great degree with his actions. It is not the custom of dogs to drive their charges through boundaries of blue banners, and it will easily be imagined the intelligence and careful training requisite to enable them to understand what was expected of them.

"Of the three dogs competing, one had taken prizes in other parts of the country in similar exhibitions, though the other two came fresh from their practical duties. Rob, the property of Mr. J. Storey, Wolsingham, a lightly made black and white dog, in capital working condition, was put on his trial first. The sheep were turned into the park, and at a sign from his master he dropped out of sight in the long grass, where he remained until another movement of the hand sent him after the sheep. He got his charge safely past the first flag, but they scattered and went pell-mell about the field. The owner was fully one hundred and fifty yards away from the dog during part of the trial, but at this distance such was the implicit obedience of the animal that a sign would either stop him when at full speed, or start him in any direction to head the sheep. It took some twelve minutes to get the sheep around the flags. It was, however, eventually accomplished, but they were much punished with their incessant exertions. One of them was exhausted at the finish and obstinately squatted. The dog, however, at last got them together again, and drove them to the pen, three of them entering with comparatively little trouble. But one pugnacious specimen, probably incensed at having been so continually on the trot, refused to enter. It defiantly faced about, and,

instead of submitting to be driven, attempted to drive the dog, and it was not until his sheepship considered his dignity properly sustained that he went in among his brethren. This event was a source of considerable amusement among the spectators. The time occupied in penning the sheep was seventeen minutes. The dog worked most intelligently, and showed off his training in a marked manner. He gave voice but three times, and notwithstanding the great trouble he had with the sheep he evinced marvelous patience, never pressing them closely or chasing them needlessly.

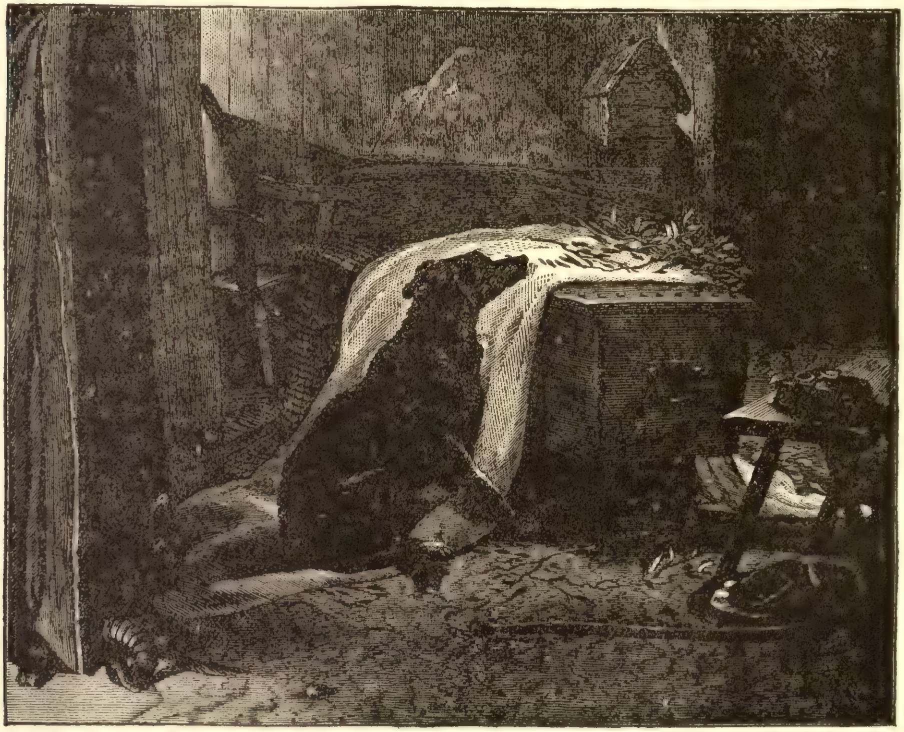
The second dog, Fly, belonging to Mr. R. Huck, Kendal, had had the benefit of experience in similar competitions, and it was thought he would win the prize. His efforts were, however, not nearly so successful as were his rival's, though he managed to get the sheep past the first two flags with little trouble. At the third, however, they broke away and made off up the park, becoming intermixed with a herd of black cattle. The dog fetched them back in a most sagacious manner, but he lost much time in getting them past the remaining flags. Eventually they were safely penned. This dog was not so fast, and did not yield immediate obedience to the gestures of his master, as did the first. He kept the sheep better together, showed equal patience and good temper, and generally furnished a capital illustration of the sagacity and intelligence of this favorite class of the canine race. The time he accomplished his work in was nineteen minutes.

Only another trial was made, this time by Mr. Wm. Lighthouse, of Northallerton's Rose. The animal was in bad condition, and, as a doggy man standing by put it, soon 'lost its wind.' It did not succeed in penning the sheep. The prize was most justly given to Rob, and this animal then furnished another instance of his intelligence. Eight sheep were then turned into the park, and he, in obedience to signs from his master, first divided them into two fours, keeping them separate for a time; then he halved one of the fours and kept them all separate, sitting quietly down to preserve their respective positions until his master walked between to count them."

A San Antonio (Texas) correspondent of the *Forest and Stream* gives the following account of a Collie puppy: "I have seen him, at a word from the shepherd, round up and put between sixteen and seventeen hundred sheep in a pen (many of them wild Mexicans), and not chase or crowd any of them. The little fellow would mass this large flock of scattered sheep and direct them toward the pen in half the time that several men could do it. When penning the sheep he had to work them down a long hill that sloped to a flat that the pen was built upon. When close in upon any portion of the flock, he could not see over them, he would scamper back up the hill and locate the position of the pen, and then flank his sheep according to his bearings. When the last sheep and frisky lamb was inside, he would sit down at the gate and slap the dust with his tail until the shepherd commenced putting up the poles that formed the gate, and I have seen him attempt to assist in that work by trying to drag the poles to the gate. At night he would keep the sheep in the pen, which consisted of brush, or if they broke out would promptly put them back. I have herded those sheep myself, and slept in a small tent a few yards from the pen. In case of the moon rising full, sheep appeared to take it for sunrise, and would break out. The first time it occurred during Dick's administration, Dick put his paws upon my breast and licked my face and awoke me. I said, 'Go for 'em, Dick!' and he did it and put the lost sheep back in the pen, and then came back and tried to tell me that all was right. After that night he needed no further hints, but took the business into his own hands, or paws. He had but little tuition, but he guarded that sheep pen as well as though he was five years of age instead of five months. If he had been guilty of any misbehavior for which he knew he deserved punishment, he would rush off and round up his flock of sheep as though he wished to show some work to atone for his misconduct. He had a nose like a bloodhound, and could follow a person's footsteps as well. I have left him asleep on the prairie more than once, stolen away and hidden myself, and watched

him follow my footsteps. He would trace every step until he found me, and then would quiver for joy."

The faithfulness of the Shepherd dog is remarkably exemplified in the following touching incident given by Dr. Dio Lewis: "One herder whom we met at Cold Spring ranch showed us a very pretty Collie dog that he said he would not sell for $500. She had at that time four young puppies. The night we arrived we visited his camp, and were greatly interested in the little mother and her nursing babies. Amid those wild, vast mountains, this little nest of motherly devotion and baby trust was very beautiful. While we were exclaiming, the assistant herder came to say that there were more than twenty sheep missing. Two male dogs, both larger than the little mother, were standing about, with their hands in their breeches, doing nothing. But the herder said neither Tom nor Dick would find them. Flora



THE HIGHLAND SHEPHERD'S CHIEF MOURNER. By Landseer.

must go. It was urged by the assistant that her foot was sore, she had been hard at work all day, was nearly worn out, and must suckle her puppies. The boss insisted that she must go. The sun was setting. There was no time to lose. Flora was called, and told to hunt for lost sheep, while her master pointed to a great forest, through the edge of which they had passed on their way up. She raised her head, but seemed very loath to leave her babies. The boss called sharply to her. She rose, looking tired and low-spirited, with head and tail down, and trotted off toward the forest. I said: 'That is too bad.' 'Oh, she'll be right back. She's lightning on stray sheep.' The next morning I went over to learn whether Flora found the strays. While we were speaking the sheep were returning, driven by the little dog, who did not raise her head or wag her tail even when spoken to, but crawled to her puppies and lay down by them, offering the little empty breasts. She had been out all night, and, while her hungry babies were tugging away, fell asleep. I have never seen any-

thing so touching. So far as I was concerned, 'there was not a dry eye in the house.' How often that scene comes back to me — the vast, gloomy forest, and that little creature, with the sore foot and her heart crying for her babies, limping and creeping about in the wild cañons all through the long, dark hours, finding and gathering in the lost sheep!

I wonder if any preacher of the gospel ever searched for lost sheep under circumstances so hard and with such painful sacrifice? But then we must not expect too much of men. It is the dog that stands for fidelity and sacrifice." Another incident of a similar kind is derived from an equally authentic source: "A shepherd lost his large flock on the Scotch Mountains in a fog. After fruitless search he returned to his cottage, bidding his Collie find the sheep if she could. The Collie, who was near giving birth to her young, understood his orders and disappeared in the mist, not returning for many hours. At last she came home in miserable plight, driving before her the last stray sheep, and carrying in her mouth a puppy of her own! She had of necessity left the rest of her litter to perish on the hills, and in the intervals of their birth the poor beast had performed her task and driven home the sheep. Her last puppy only she had contrived to save.

Spanish Shepherd Dog. — This variety of the Shepherd dog is sometimes called the "wolf-dog," being much larger, stronger, and swifter than the Collie. It is employed quite extensively in Spain in watching the mountain flocks. Although gentle in disposition, he will fight with desperate courage when it is necessary. This dog partakes something of the setter type, and also slightly resembles the Collie. The limbs are clean and long, hair of medium length, ears drooping, tail slightly bushy.

German Sheep Dog. — This dog closely resembles the Spitz, though considerably smaller in size, and as a pet dog is much safer than the latter, being more amiable and affectionate in disposition. He has upright ears, a short muzzle, shaggy hair, and a bushy tail that he carries directly over his back. He is sprightly, intelligent, and tractable, and makes an excellent assistant for the shepherd.

Pomeranian, or Spitz Dog. — With the reputation of being snappish in temper and unsafe to be trusted with children, the Pomeranian or Spitz dog is much less popular than formerly. In their native country, they are employed as a sheep-dog, a position for which they are by nature admirably fitted, their long woolly hair furnishing an excellent protection against the wet and cold. He is like the Collie in being impatient of control in playing tricks, but unlike the latter he is cowardly, and prefers to run away rather than fight when the choice is given him. These dogs are very cleanly in their habits, and generally free from odors that most dogs have in their coat and breath. They have a beautiful coat of hair which is long, fine, and smooth, pure white in color, short muzzle, prick ears, and a bushy tail carried directly over the back.

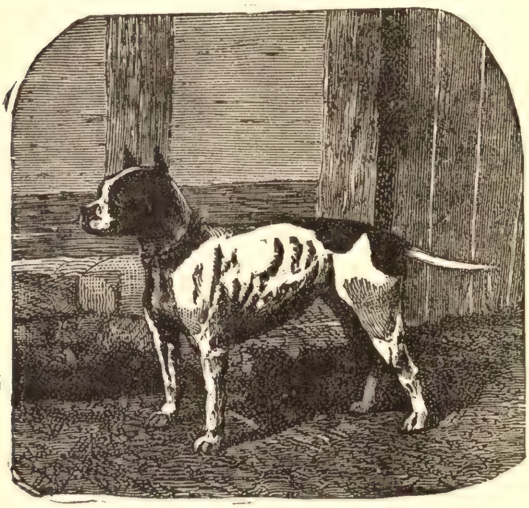
The Bull-Dog. — The Bull-dog is the most ferocious of all the canine race, and is also noted for great tenacity, being made to let go his hold with the greatest difficulty when once he has obtained the advantage. The chief characteristic seems to be sullen ferocity, and great muscular power. An English writer says of this breed: "The mental qualities of the Bull-dog may be highly cultivated, and in brute courage and unyielding tenacity of purpose he stands unrivaled among quadrupeds, and with the single exception of the game-cock, he has perhaps no parallel in these respects in the brute creation. Two remarkable features are met with in this breed: First, they always make their attack at the head; and, secondly, they do not bite and then let go their hold, but retain it in the most tenacious manner, so that they can with difficulty be removed by any force which can be applied.

Instances are recorded in which Bull-dogs have hung on to the lip of the bull (in the old days of baiting this animal) after their entrails have been torn out, and while they were in the last agonies of death. Indeed, when they do lay hold of an object, it is always necessary to

choke them off, without wnich resource they would scarcely ever be persuaded to let go. From confinement to their kennels, they are often deficient in intelligence, and can rarely be brought under good control by education. Owing to the same cause, they show little personal attachment, so that they sometimes attack their friends as well as their enemies, when their blood is up.

But, when differently treated, the Bull-dog is a very different animal, the brutal nature which he so often displays being mainly attributed to the savage human beings with whom he associates. Although, therefore, I am ready to admit that the Bull-dog often deserves the character for ferocity which he has obtained, yet I contend that this is not natural to him, any more than stupidity and want of affection, which may readily be proved to be the reverse of his character, if any one will take the trouble to treat him in a proper manner."

Cuvier avers that the Bull-dog has a brain that is smaller in proportion to his size than any other of his congeners, and thus accounts for his lack of sagacity. Other writers dispute this; however it may be, this dog is less valued than many other breeds for general purposes, but is useful for crossing upon the less courageous breeds and tender-mouthed dogs, in order to give them courage and holding qualities. The points of a well bred Bull-dog are as follows: Head round, skull high; eye medium-size, and the forehead well sunken between them; ears small and partially erect, placed rather close together; muzzle short and truncate; jaws heavy and strong; back short; chest deep and broad; legs strong and muscular. The coat should be fine and smooth, unmixed colors being preferred, such as red, fawn, blue smut, and white. This breed of dogs varies greatly in weight, the larger varieties sometimes weighing over seventy pounds. They should be strong and muscular, without an excess of fat, courageous without a blind, savage ferocity, intelligent, open-eyed, deep-voiced, and not over affectionate, as it is generally thought that the Bull-dog most demonstrative in affection, is the most liable to be treacherous.



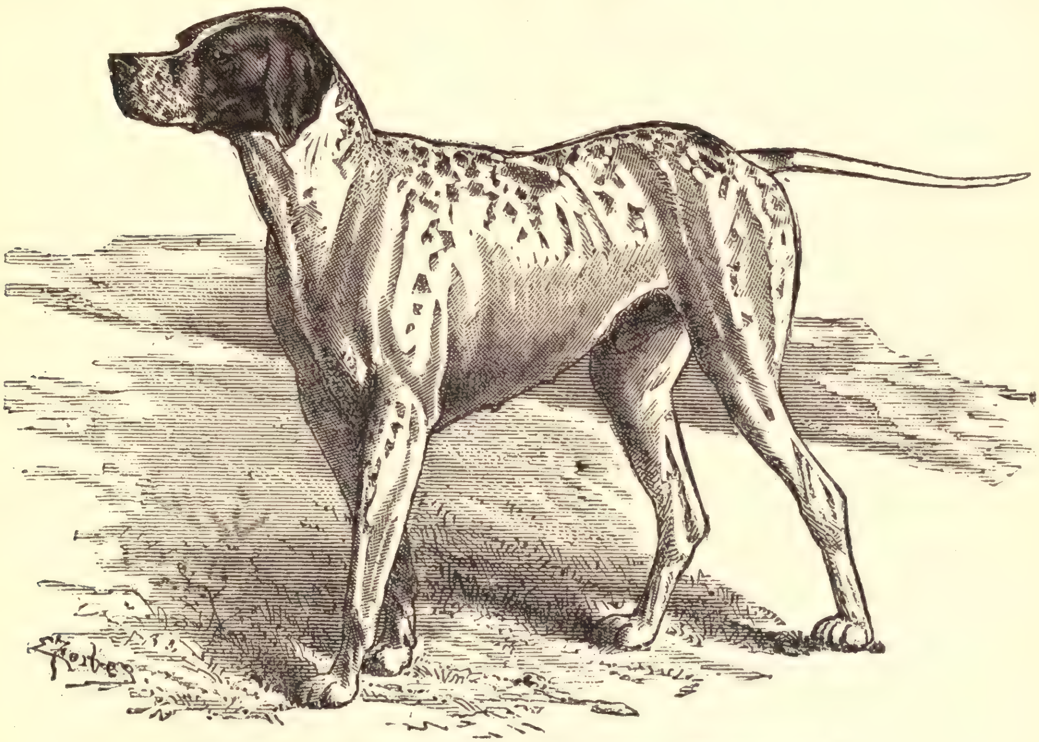
ENGLISH BULL-TERRIER.

The Bull-Terrier.—When properly bred, the cross between the Terrier and Bull-dog makes a valuable dog for all practical purposes, they being intelligent, obedient, affectionate, and courageous; in fact, a valuable house dog, as well as an exterminator of all that class of pernicious animals that are liable to infest the farm. A leading English authority says of them: "Many of our smooth Terriers are slight crossed with the Bull-dog, in order to give courage to bear the bites of the vermin which they are meant to attack. When thus bred, the Terrier shows no evidence of pain, even though half a dozen rats are hanging on to his lips, which are extremely tender parts of the body, and where the bite of a mouse even will make a badly bred dog yell with pain. In fact, for all the purposes to which a Terrier can be applied, the half or quarter cross with the Bull, commonly known as the 'Bull-Terrier,' or 'half-breed dog,' is of more value than either of the purely bred progenitors.

Such a dog, however, to be useful, must be more than half Terrier, or he will be too heavy and slow, too much under-jawed to hold well with his teeth, and too little under command to obey the orders of his master. Sometimes the result of the second cross, which is only one-quarter Bull, shows a great deal of the shape peculiar to that side; and it is not until

the third or fourth cross that the Terrier shape comes out predominant. This is all a matter of chance, and the exact reverse may just as probably happen, although the Terrier was quite free from the stain of the Bull, which is seldom the case.

The points of the Bull-Terrier vary in accordance with the degree of each strain in the specimen examined. There should not be either the projection of the under jaw, or the crooked fore legs, or the small and weak hind-quarters; and until these are lost, or nearly so, the crossing should be continued on the Terrier side. The perfect Bull-Terrier, may, therefore, be defined as the Terrier with as much Bull as can be combined with the absence of the above points, and showing the full head (not of course equal to that of the Bull-dog), the strong jaw, the well-developed chest, powerful shoulders, and thin fine tail of the Bull-dog, accompanied by the light neck, active frame, strong loin, and fuller proportions of the hind-quarter of the Terrier. A dog of this kind should be capable of a fast pace, and will stand



POINTER "RUSH," OWNED BY EDMUND ORGILL, BROOKLYN, N. Y.

any moderate amount of road work. The height varies from ten inches to sixteen, or even twenty. The color most admired is white, either pure or patched with black, blue, red, fawn, or brindle, sometimes black and tan, or self-colored."

The Pointer. — Among sportsmen, the Pointer and the Setter seem to be equally admired, they being the most beautiful and valuable of all sporting dogs. With the Newfoundland, St. Bernard, Collie, and many other varieties, they belong to the Spaniel class, yet the Pointer seems more remotely removed from this class than any other breed belonging to it. He possesses a more delicate scent than any other of the field dogs, and in pointing game he has no superior. They are exceedingly intelligent animals, and though taking naturally to the hunting and pointing of game, they must be carefully trained for this purpose, in order to be perfectly reliable. It is stated by reliable authority that both Pointers and Setters have been known to refuse to work longer when loaned to a poor marksman who made repeated

and ineffectual attempts to bring down the game, but would trot off towards home, and no coaxing or command would be effectual in bringing them back. Instances are on record where Pointers have stood motionless pointing the game for an almost incredible length of time.

Thus one gentleman owning a brace of Pointers, tells of their standing motionless for an hour and a quarter, another for over two hours. In the latter case, which was a female dog belonging to a Mr. Lee, the animal stood with her hind legs on a gate just as she jumped over, where was a nest of partridges close to her nose. Her owner was out gunning with other dogs also, and did not miss his favorite Clio for a long time; finding she did not come at his call, he went back to look for her, and found her in that position; had she moved at all, she would have disturbed the birds. Mr. Lee's approach disturbed them, some of which he shot, but the poor dog was so stiff from her long standing in the same unnatural position, that she could scarcely move, and her master sat down on the grass and rubbed her legs until she could bend them freely.

The points desirable in the Pointer are a head of moderate size, rather wide, with a high forehead and intelligent eye. The muzzle should be broad, with the outline square in front, and not receding, as is the case with the hound. Flews not pendant. The head should be well set, the neck long, smooth, and convex in the upper outline. The body of good size and length, with wide chest and hips. The tail should be strong where it joins the body, suddenly diminishing, and continuing of the same size until within two inches of the tip, where it terminates in a sharp point. The absence of this characteristic is said to show a cross with the hound or some other breed. The shoulders are points of great importance in the Pointer, since unless well formed he will not have the endurance for long journeys or be quick in his work.

The blade should be long, slanting but muscular, the upper arm long, and fore-arm short, the elbow being well down below the chest. The legs should be strong, with a strong knee and ankle, the foot round, with a thick sole. The color is generally mainly white with a few small spots of some other color; white, with black, reddish, or yellow heads, are the most prized, since the white makes them more conspicuous, and they are not as easily lost sight of in pointing as those of a dark color or black. The previous illustration of the noted pointer, "Rush," is a fine type of the breed. This dog has taken the first prize repeatedly at shows in different parts of the country, and is remarkable for combining in an unusual degree, intelligence, patience, firmness, gentleness, and good judgment.

The Setter.—The Setter is, without doubt, descended from the Spaniel, or both are derived from the same parent stock. He has no superior in intelligence and value as a field dog, being remarkably intelligent, affectionate, and docile, beside not lacking in courage. A well trained setter makes a most reliable house dog, as well as trusty and efficient helper in the field. The original colors were chestnut, dark bay, and white.

The English Setter.—There are many different strains of the English Setter, all differing in a greater or less degree. They are generally white, with black or brown marks. The Gordon Setter, which is an English strain, is black, or black with a tinge of brown or tan; the black should be a jet black without mixture, and the tan a dark mahogany color. This strain is heavier built, and has not so fine breeding as the white and brown English or the Irish Setter. The Llewellen Setter is a pure English Setter, made up from the Laverack, Southesk, and Gordon crosses. The strain goes back on the Southesk-Gordon side of the breed to the Dulse-Rhoebe cross, which, with the Laverack for a basis, was the starting point of Mr. Llewellen, the originator of the strain. The illustrations of this variety on a previous page are made from photographs of animals that have won many prizes at shows, and are fine types of the strain.

Points of the English Setter.—The points of the English Setter as derived from English sources are as follows: *The Skull.*—The skull has a character peculiar to itself, somewhat between that of the pointer and cocker spaniel, not so heavy as the former's, and larger than the latter's. It is without the prominence of the occipital bone so remarkable in the pointer, is also narrower between the ears, and there is a decided brow over the eyes.

The Nose.—The nose should be long and wide, without any fullness under the eyes. There should be in the average dog setter at least four inches from the inner corner of the eye to the end of the nose. Between the point and the root of the nose there should be a slight depression—at all events, there should be no fullness—and the eyebrows should rise sharply from it. The nostrils must be wide apart and large in the openings, and the end should be moist and cool, though many a dog with exceptionally good scenting powers has had a remarkably dry nose, amounting, in some cases, to roughness like that of shagreen. In all setters the end of the nose should be black, or dark liver-colored, but in the very best bred whites, or lemon and whites, pink is often met with, and may be pardoned in them. The jaws should be exactly equal in length, a "snipe nose," or "pig jaw," as the receding lower one is called, being greatly against its possessor.

Ears, Lips, and Eyes.—With regard to ears, they should be shorter than the Pointer's, and rounded, but not so much so as those of the Spaniel. The "leather" should be thin and soft, carried closely to the cheeks, so as not to show the inside, without the slightest tendency to prick the ear, which should be clothed with silky hair little more than two inches in length. The lips also are not so full and pendulous as those of the Pointer, but at their angles there should be a slight fullness, not reaching quite to the extent of hanging. The eyes must be full of animation, and of medium size, the best color being a rich brown, and they should be set with their angles straight across.

The Neck.—The neck has not the full rounded muscularity of the Pointer, being considerably thinner, but still slightly arched, and set into the head without that prominence of the occipital bone which is so remarkable in that dog. It must not be "throaty," though the skin is loose.

Shoulders and Chest.—The shoulders and chest should display great liberty in all directions, with sloping deep shoulder blades, and elbows well let down. The chest should be deep rather than wide.

Back, Quarters, and Stifles.—An arched loin is desirable, but not to the extent of being "roached" or "wheel-backed," a defect which generally tends to a slow up-and-down gallop. Stifles well bent, and set wide apart, to allow the hind legs to be brought forward with liberty in the gallop.

Legs, Elbows, and Hocks.—The elbows and toes, which generally go together, should be set straight; and if not, the "pigeon-toe" or inturned leg is less objectionable than the out-turn, in which the elbow is confined by its close attachment to the ribs. The arm should be muscular, and the bone fully developed, with strong and broad knees, short pasterns, of which the size in point of bone should be as great as possible (a very important point), and their slope not exceeding a very slight deviation from the straight line. Many good judges insist upon a perfectly upright pastern, like that of the Fox-hound; but it must not be forgotten that the Setter has to stop himself suddenly when at full stretch he catches scent, and to do this with an upright and rigid pastern causes a considerable strain on the ligaments, soon ending in "knuckling over;" hence a very slight bend is to be preferred. The hind legs should be muscular, with plenty of bone, clean, strong hocks, and hairy feet.

The Feet.—The feet should be carefully examined, as upon their capability of standing wear and tear depends the utility of the dog. A great difference of opinion exists as to the comparative merits of the cat and hare foot for standing work. Fox-hound masters invariably select that of the cat, and as they have better opportunities than any other class of insti-

tuting the necessary comparison, their selection may be accepted as final. But as Setters are specially required to stand wet and heather, it is imperatively necessary that there should be a good growth of hair between the toes, and on this account a hare foot, well clothed with hair, as it generally is, must be preferred to a cat foot, naked, as is often the case, except on the upper surface.

The Tail.—The flag is in appearance very characteristic of the breed, although it sometimes happens that one or two puppies in a well-bred litter exhibit a curl or other malformation, usually considered to be indicative of a stain. It is often compared to a scimitar, but it resembles it only in respect of its narrowness, the amount of curl in the blade of this Turkish weapon being far too great to make it the model of the Setter's flag. Again, it has been compared to a comb; but as combs are usually straight, here again the simile fails, as the Setter's flag should have a gentle sweep; and the nearest resemblance to any familiar form is to the scythe with its curve reversed. The feather must be composed of straight, silky hairs, and beyond the root the less short hair on the flag the better, especially towards the point, of which the bone should be fine, and the feather tapering with it.

Symmetry and Quality.—In character the Setter should display a great amount of "quality," a term which is difficult of explanation, though fully appreciated by all experienced sportsmen. It means a combination of symmetry, as understood by the artist, with the peculiar attributes of the breed under examination, as interpreted by the sportsman. Thus a Setter possessed of such a frame and outline as to charm an artist would be considered by the sportsman defective in "quality" if he possessed a curly or harsh coat, or if he had a heavy head with pendent bloodhound-like jowl and throaty neck. The general outline is very elegant, and more taking to the eye of the artist than that of the pointer.

The Hair.—The texture and feather of coat are much regarded among setter breeders, a soft, silky hair without curl being considered a *sine quâ non.* The feather should be considerable, and should fringe the hind as well as the fore legs.

Color.—The color of coat is not much insisted on among English setters, a great variety being admitted. These are now generally classed as follows, in the order given: (1) Black and white ticked, with large splashes, and more or less marked with black, known as "blue Belton;" (2) orange and white freckled, known as orange Belton; (3) plain orange, or lemon and white; (4) liver and white; (5) black and white, with slight tan markings; (6) black and white; (7) liver and white; (8) pure white; (9) black; (10) liver; (11) red or yellow.

The Irish Setter.—This breed has great stamina and endurance, as well as valuable qualities in other respects, being sagacious, quick, courageous, and as good on the scent of game as sporting dogs will average. His style of moving is easy, with a free action of the shoulders, and his hind legs brought well under him. There are two varieties or strains of the Irish Setter, the red, and the white and red. "Rory O'More" and "Mag," illustrations of which are given, are both fine specimens of this breed, having won many prizes at shows. "Rory" made his first appearance in public as a show dog in New York under the auspices of the Westminster Kennel Club in 1877. Although then only nineteen months old, he carried away the first prize from a host of competitors. On the same occasion a $250 cup offered for the finest specimen of a dog of any breed, including native or imported setters or pointers, was awarded to him.

"Rory" was again on the bench at the shows given in New York in 1879 and 1880, at both of which he was the captor of the highest honors, being awarded the championship again the first year, and the Tiffany necklace the second. He has since that time continued to maintain his good record in capturing prizes. "Mag" was a winner of the first prize in the puppy class at the New York Bench Show in 1880. She was also a winner of the second prize in the open class at New York in 1881.

IRISH SETTER, "RORY O' MORE."
Property of W. N. Callender, Greenbush, N. Y.

IRISH SETTER, "MEG."
Owned by Benj. F. Clark, Manchester, N. H.

Points of the Irish Setter.—The following description of points applies to the pure red variety, but the white and red differ from them only in color. It will be seen that although resembling the English Setter, in some respects, the Irish Setter differs very materially from them in others:

The Skull.—The skull is somewhat longer and narrower, the eyebrows being well raised, and the occipital prominence as marked as in the Pointer. *The Nose.*—The nose is a trifle longer, with good width, and square at the end: nostrils wide open, with the nose itself of a mahogany or very dark fleshy-color, not pink nor black. *Eyes, Ears, and Lips.*—The eyes should be a rich brown or mahogany color, well set, and full of intelligence; a pale or gooseberry eye is to be avoided. Ears long enough to reach within half an inch or an inch of the end of the nose, and, though more tapering than in the English dog, never coming to a point; they should be set low and close, but well back, and no approaching to Hound's in setting and leather. Whiskers red; lips deep, but not pendulous. *The Body.*—In frame the Irish dog is higher on the leg than either the English or Black-and-Tan, but his elbows are well let down nevertheless; his shoulders are long and sloping; brisket deep, but never wide; and his back ribs are somewhat shorter than those of his English brethren. Loin good, slightly arched, and well coupled to his hips, but not very wide; quarters slightly sloping, and flag set on rather low, straight, fine in bone, and beautifully carried. Breeders are, however, going for straight backs like that of Palmerston, with flags set on as high as in the English Setter. *The Legs.*—Legs very straight, with good hocks, well-bent stifles, and muscular but not heavy haunches. *The Feet.*—The feet are hare-like, and moderately hairy between the toes. *The Tail.*—The tail is clothed with a long, straight comb of hair, never bushy or curly, and this is beautifully displayed on the point. *The Coat.*—The coat should be somewhat coarser than that of the English Setter, being midway between that and the Black-and-Tan, wavy but not curly, and by no means long. Both hind and fore legs are well feathered, but not profusely, and the ears are furnished with feather to the same extent, with a slight wave, but no curl. *The Color.*—The color should be a rich blood red, without any trace of black on the ears or along the back; in many of the best strains, however, a pale color or an occasional tinge of black is shown. A little white on the neck, breast, or toes, is by no means objectionable, and there is no doubt that the preponderance of white, so as to constitute what is called "white and red," is met with in some good strains.

Retrievers.—There are various kinds of dogs used for retrieving in open or covert shooting. Retrievers proper, however, are cross-bred dogs, the principal of which are the English Retriever, which is a cross between the Irish Water Spaniel and the Newfoundland; another valuable strain as a cross between the former and the English Setter. Another variety known as the Chesapeake Bay Retriever, is represented by three different strains, viz.: the Red Winchester, a dog with long smooth hair, the Curly Retriever, having curly hair of a reddish-brown color, and the Otter breed, a short-haired, smooth-coated dog of a tawny brown color. The object of the cross is to produce a dog sufficiently strong to carry heavy game, such as rabbits and large birds; and having sufficient hardiness not to be affected by running in cold water. The English Retriever has generally a curly coat, and is black and tan in color.

The qualities which are essential in the regular Retriever have been given as follows: "Great delicacy of scent, and power of stopping (which latter is often not possessed by the Pointer); cleverness to follow out the windings of the wounded bird, which are frequently most intricate, and puzzle the intelligence as well as the nose to unravel them; love of approbation, to induce the dog to attend to the instructions of his master, and an amount of obedience which will be required to prevent his venturing to break out when game is before him. He should also have an excellent temper."

The following anecdote is related of an English Retriever belonging to Sir Charles Taylor, which shows the wonderful intelligence of the animal. It was the custom of Sir

Charles to occasionally on a morning send out this dog to see if the weather was suitable for gunning, saying to him: "Go out and see if it will do." The dog would go out, walk round the house, putting his nose up in the air for a few moments, and then come back to the house. If "it would do," he would jump up on his master's knees and spring about the room in the most lively manner. Sir Charles would then tell him to fetch Tom, the keeper. Off he would go, sometimes to the distance of about a mile, to fetch the keeper. He would scratch at the keeper's door, run towards the corner where the guns were kept, and by delighted barks tell Tom that he was wanted to go out shooting. And then they would both be soon ready for the day's sport. If, on the contrary, "it would not do," the dog would come in slowly, looking down on the carpet in a dejected way, throw himself at length upon the rug, and go to sleep.

CAN'T YOU TALK?

The English Spaniel.—This is an excellent water dog, being one of the best swimmers and divers in the canine family. In duck shooting he is exceedingly valuable, as he never refuses to go where he can find game. He is nervous and restless, and requires to be kept under good control when used as a Retriever. There are two varieties, one much smaller than the other.

The Clumber Spaniel.—This variety of the Spaniel family of dogs is much used in England for partridge shooting. He is intelligent, strong, and remains perfectly mute when on the scent, and for this reason is much valued for hunting such game as take wing at the slightest noise. This dog has a large head, wide and full, muzzle broad and square, ears long and covered with wavy hair, eyes large and expressive, large bones, great length of body, rather short legs, and bushy tail; hair long and wavy. The color is yellow and white, the white prevailing.

The Irish Water Spaniel.—There are two varieties of the Irish Water Spaniel. Those of Northern Ireland have a curly coat, generally of a liver color with more or less

white, so that white frequently predominates, short ears with but little feather on them or on the legs. The south country Irish Water Spaniel is uniformly of a pure liver color, with the whole coat consisting of short, crisp curls; ears long and well feathered, the distance from the point of one ear to the point of the other sometimes measuring two feet; the body is large and heavy; legs strong; tail not feathered and carried slightly down. These dogs are generally from twenty-one to twenty-two and a half inches in height. The head of the best specimens is crowned with a well defined top-knot that comes down to a peak on the forehead. Those from the South of Ireland are most prized, they being very intelligent and easily trained.

The English Greyhound.—The term hound, as formerly used, included all dogs of the chase, or those used in securing game, but as used at present, it denotes only dogs that follow game by scent or sight, such as the different varieties of the Greyhound, the Bloodhound, Staghound, Foxhound, Beagles, Terrier, etc. The Greyhound is noted for beauty and grace of form, and great speed, and for ages has been employed in the chase, having been a great favorite with the wealthy and higher classes from the earliest historic times. The Greyhound seems generally to lack the affection, sagacity, and courage possessed by some dogs, although numerous instances might be cited in individual cases in which they evinced these qualities in a remarkable degree.

The English Greyhound is generally conceded to be the finest of this breed of dogs, being beautiful in form, possessing great courage and a fair amount of intelligence. They are kept principally in this country for their beauty, fleetness, and for hunting hares, rabbits, and similar small game. The points of the Greyhound were given in the familiar doggerel rhyme published in 1496, by Wynkynde Warde, who was a printer and writer of that time. The lines show the comparison between this breed of that time, and the present:

> Headed lyke a snake,
> Neckyed lyke a drake,
> Footed lyke a catte,
> Tayled lyke a ratte,
> Syded lyke a bream
> And chyned like a beam.

Of course all due allowance should be made for exaggerating the different points; for instance, every snake's head is flat and broad with the nose compressed, while the head of the Greyhound, though somewhat flat at the top, is comparatively circular in its transverse section, and the nose is triangular. "Sides like a bream, and back like a beam," we understand to mean great depth and breadth of chest, combined with a strong back. The foot resembles that of a cat in being round in form. The most fashionable colors at present are maltese or black, though very good specimens are seen of red, fawn, brindle, and white.

The Deerhound, or Rough Scotch Greyhound.—This is a noble and valuable animal, but at present rarely pure-bred. It is larger than the pure Greyhound, often attaining a height of twenty-eight inches, and weighing over eighty pounds. They have great speed and strength, and are used in deer hunting. They are always courageous, intelligent, and docile.

The Foxhound. — The modern Foxhound has been very carefully bred during the last two or three centuries, and consequently the breed has attained a high degree of perfection. It was produced by a cross between the old English hound and the Greyhound. They are noted for great power of scent, fleetness, courage, and endurance, and always cry out when on the scent, the tone of the dog usually indicating whether the scent is sure or not. Thus, if not quite sure, the note is given at intervals and undecidedly; but if sure, they run open-mouthed in full cry. A pack of hounds on the track of game, in full, united cry,

produce rare music for the true sportsman's ear. The Foxhound has been known to travel in the chase over four miles in seven minutes, while its endurance has been shown by the Duke of Richmond's hounds, that ran ten hours before killing the fox, during which time several of the sportsmen tired their horses. The following points of the Foxhound are condensed from the National (English) Dog Club Book:

The head should be light, indicative of great intelligence, and at the same time full of dignity, with a certain amount of chop, and the forehead a little wrinkled; the neck long and clean, with no approach to dewlap or cravat; the ears should be set low and lie close to the head; the shoulders long and well sloped back; the chest deep and wide; the elbows in a straight line with the body; the fore legs quite straight, large in bone, and well clothed with muscle; the pasterns or ankles must be large, strong, and straight, without turning in or out;

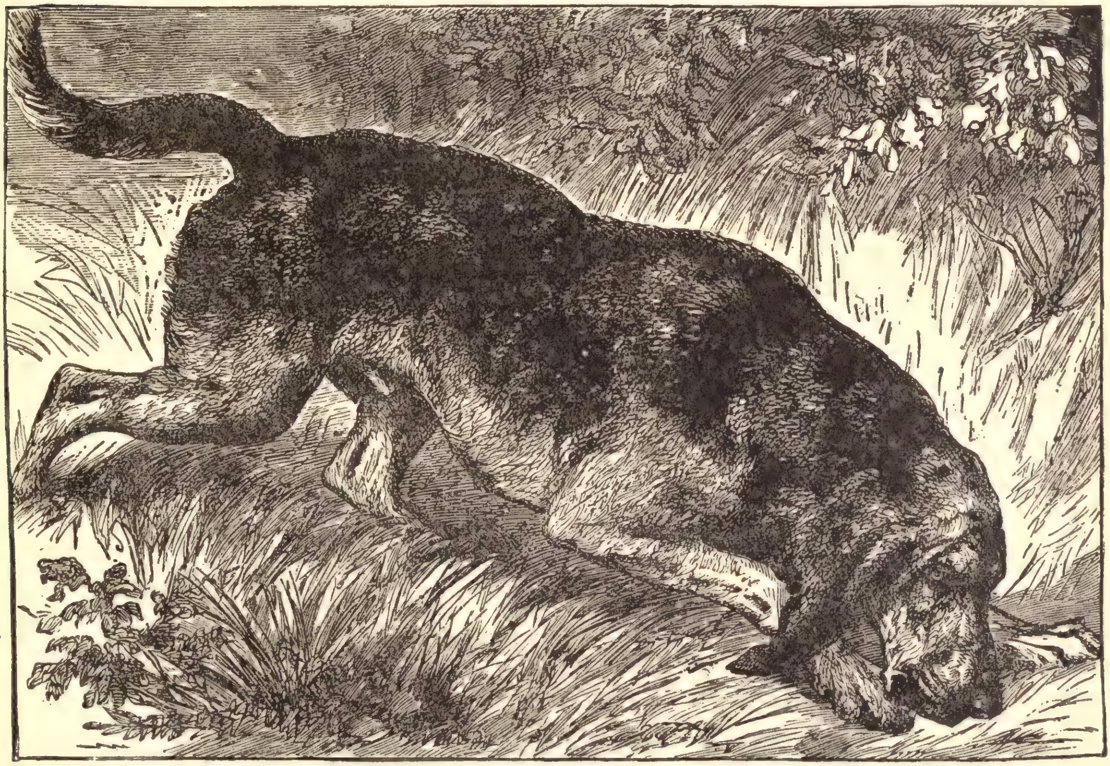
FOXHOUND "WATCHMAN,"
Property of W. A. Van Brunt, Horicon, Wisconsin.

the feet round and rather flat than arched, the divisions between each toe being just apparent; the sole of the foot hard and indurated. The back should be straight, wide, and muscular; the loins strong and square; the hind quarters powerful, and the back ribs deep. The color usually preferred is black, white, and tan, the black and tan predominating. The coat should be smooth and glossy. The cut of "Watchman" is an excellent representative of the breed. This animal was imported from Sir Bache Cunard's kennel, England.

The Bloodhound.—This breed derives its name from its peculiar and extraordinary power of scent, they being able to follow any trail upon which they may be put, however intricate the track may be, or to what an extent it may have been crossed and recrossed by the tracks of others. The Bloodhound also possesses great courage, and is inclined to be ferocious, especially when kept much confined. Though frequently manifesting great

affection, gentleness, and faithfulness towards his master and friends, he can scarcely be considered a safe companion for man, and must ever be regarded with some degree of suspicion, a ferocious nature often suddenly and unexpectedly manifesting itself when least expected.

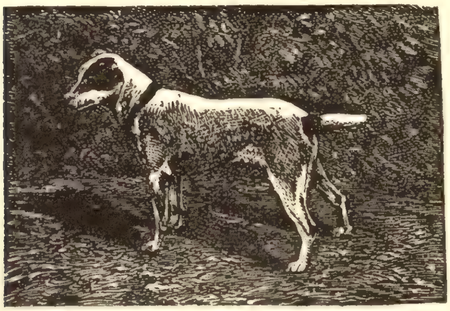
Pure specimens of this breed are rare, they having been frequently crossed with the Bulldog to render them more ferocious. In this country the Bloodhound is most common in the Southern States. The height ranges from twenty-four to thirty inches at the shoulder. In the best types of the English Bloodhound the head should be rather large, the forehead long and narrow; the eyes expansive, but deep and sunken, with the third eyelid, or what is called the *haw*, plainly visible, giving a peculiar redness to the eyes and imparting a fierce expression. The ears are very long, thin, and pendant, hanging straight down the sides of



BLOODHOUND.

the face; it is said that if they rise when the dog is excited, it shows that there is cross blood in the animal. The nose is large and black or dark in color, the face and upper jaw to the nose narrow; the lips (sometimes called flews) should be long, thin, and pendulous. The ears and flews of the perfect Bloodhound are long enough to touch each other when brought under the chin. The neck should be long and strong, the shoulders heavy and powerful, the feet large and compact. The back should be broad, the chest deep and full, and the tail carried in a graceful upward curve. His voice is deep, sonorous, and full, and when in pursuit the tone is kept up in a prolonged bay. The color is a reddish tan, darkening towards the head and back, or a black tan; no white should be seen, except perhaps on the tip of the tail. They are excellent aids in tracking criminals or large game, and except for this purpose are of but little use.

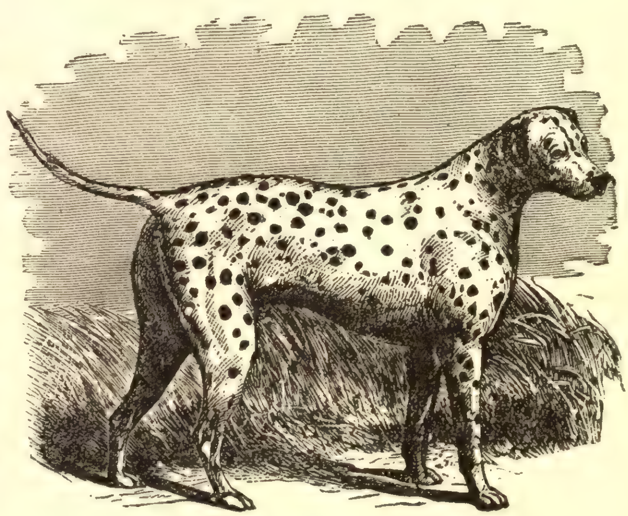
The Fox Terrier. — The principal use of this dog formerly was as a supplement to every pack of Foxhounds, for pulling foxes from their holes of refuge inaccessible to the larger dogs. At the present time, however, the hunting pace is too rapid for his fleetness, and he would be left considerably in the rear. He is, however, a very useful dog for general purposes about the farm, combining as he does many excellent qualities, he being a very good watch dog, ever on the alert for intruders, and one of the best dogs known for ridding the farm of foxes, skunks, woodchucks, minks, rats, etc., while he is very sagacious, courageous, and pleasant tempered. His weight is from sixteen to eighteen pounds. The head is narrow between the eyes, but widens between the ears; the ears are small and thin, lying close to the cheek, and are set well back on the head; eyes small, but intelligent in expression; jaws strong; chest full and round, but only of medium depth; neck rather light; back straight; tail short; limbs straight and strong. The color is white, with black or tan markings (sometimes both) about the head. The coat is fine, compact, and short.



FOX TERRIER.

German Badger Hound, or Dachshund. — This breed of dogs is exceedingly valuable for hunting the badger, raccoon, foxes, and similar animals. They are sure of scent, and although rather slow in pursuit are the most persistent of dogs, never giving up until they are forced to do so. They are affectionate, intelligent, cheerful in disposition, and possess great courage and independence of character. They resemble in some respects the hound, in others the terrier, although they are wholly unlike either. The head is large, chest deep and broad, body disproportionately long for its size, legs short and stout, bones heavy and strong, skin thick and elastic, hair short, wiry, and rather coarse. The usual colors are black with tan markings, brown with tawny markings, brownish red and gray with brown flecks. He is a homely animal, but hardy and useful, and when kept as a house pet makes an excellent watch dog, though apt to be snappish to strangers.

The Dalmatian or Coach Dog. — This is a well-formed, handsome dog, somewhat resembling the Pointer in shape. He is about twenty-five inches high, beautifully spotted with black on a white ground, the spots being about an inch in diameter, of nearly uniform size, and quite evenly distributed; they are also quite distinct from the white. These dogs are remarkably fond of horses, and of accompanying them on the road, and were formerly, in England, considered an ornamental appendage to accompany carriages; hence they derived the name of "Coach Dog." This custom has at



DALMATIAN OR COACH DOG.

present ceased to be fashionable. In his native country this dog is used to a certain extent as a Pointer in the field, and is said to perform this duty quite well.

Black-and-Tan Terrier. — Of all the pet and toy dogs, this is without doubt the most highly esteemed and attractive. They are remarkably active and intelligent little creatures, are very affectionate, and fond of being petted. These dogs are bred from the diminutive weight of three and a half pounds to fifteen or sixteen, five or six pounds weight being quite common. The small Italian Greyhound has been used in reducing the size of these dogs; they are therefore quite sensitive to the cold, and should be kept warm and comfortable in winter, being provided with the protection of a blanket when out of doors, and a bed and covering at night. These dogs are mainly black, the lower portions of the face, inside of the legs, and feet being tan; the lower part of the breast is also marked with tan, while directly over the inner corner of each eye is a distinct spot of tan nearly circular and about as large as a good-sized pea. The insides of the ears are also more or less marked with tan. In form they much resemble the small Italian Greyhound. We have one of these little dogs that weighs about seven pounds. He is one of the most intelligent animals we ever saw, seeming to understand distinctly all that is said to him, while he expresses his wishes very clearly by his dog talk and other ways of making himself understood. He is ever watchful of all intruders, and suspicious of strangers; but when he has once made up his mind that they are friends of his master and mistress, he treats them as friends. He is very jealous of the cat and other dogs that the mistress bestows any affection upon, and will seek to crowd or pull them aside, and beg to be caressed himself. He will walk all about the room on the tips of his hind toes, sneeze, shake hands, and "speak" when told, and sit up and sing if a person hums a tune for him, his singing being a kind of prolonged howl on a high key.

He is very courageous, and even impudent to larger dogs, always attacking them if they come upon the premises, and frequently inviting an attack from large dogs that generally trot off without seeming to notice him. These little creatures make excellent watch dogs in giving warning, as they are ever on the alert, and will bark excitedly at the least noise. Some one has well described this most intelligent and affectionate of pets in the following lines:

MY BLACK AND TAN.

I have a dainty playmate, dear
As is none other to me here
Of my own clan;
A brass-girt collar decks his throat,
And shines like silk his glossy coat
Of black and tan.

Companion of my lonely walks,
He trots beside me oft, he talks
As best he can;
Then, wild with sudden glee, will rush
And bark defiance at a thrush,
My black and tan.

Across his puzzled brain there throng
Confused ideas of right and wrong;
He has no plan
Of conduct for his daily guide.
The god he worships dwells inside
His black and tan.

You're very human, little friend;
I wonder if perchance you end
Where I began?
One faithful heart, I know, would ache
Were I with life for aye to break,
Ah! black and tan!

Maybe we're not so far apart;
Where is the point from which I start
To be a man?
Come, shake a paw, and let us think
If we can find the missing link,
My black and tan.

The Scotch Terrier. — There are many varieties of the Scotch Terrier, all of which are active, intelligent, very affectionate, and persistent hunters of rats, mice, and other vermin; in fact they will hunt anything from a fox to a mouse. The principal varieties of this breed of dogs are the Skye, the Rough-haired, Smooth-haired, and the Wire-haired or the Dandy Dinmonts, all differing more or less in size, form, and color.

The Skye Terrier. — The origin of the Skye Terrier is so remote as to be lost in antiquity; he certainly merits the claim to belong to one of the very first families of the canine race. There are two varieties of Skyes, known as the prick-eared and the drop-eared, and upon the manner in which they carry their ears much depends in judging of their respective points.

SCOTCH TERRIER.

In either case, the ears should be placed well up on the top of the head, the prick-ears standing boldly erect, and the drop-ears standing close to the side of the head. There is also the short-haired and long-haired variety. The first has hair of coarse quality, glossy — not woolly — slightly wavy, and covering a soft, thin waterproof undercoat that serves as a great protection to the skin. The long-haired or pet Skye has a much heavier and longer coat than the former, which is so compact and heavy that it is often compared to a mat. The grooming that these pet dogs receive adds much to the fine appearance of the coat, but the hair is always but slightly wavy, or nearly straight. The best Skyes carry their tails high. In color they may be brown, gray, silver gray, blue, black, and fawn, although the short-haired variety are mostly brown. A critical judge of this breed, in describing the long-haired variety, says:

SKYE TERRIER "FLORA,"
Bred by Gen. G. McDonald, Rosshire, N. B.

"It should have its ears, legs, and tail all merged in one mass, with the exception of the tip of the latter, and of the feet. In a well-coated specimen the eyes are only to be guessed at, and even the nose is often obscured; but generally they are each more or less visible on a

close inspection. The eyes are keen, expressive, small, and generally of dark color, either black or brown, as are the nose and palate. The ears are of good size, that is, about three inches long, clothed thickly with hair, which should mingle with that of the face and neck, and decidedly falling, but not quite close to the cheek, owing to the quantity of hair by which they are surrounded. The shape of the head is not easily got at, but it is somewhat wide, while the neck is unusually long. The body, also, is too much coated to show its shape, and the form of the shoulders and back ribs can only be ascertained by handling, or by dipping the dog in water, when the shape at once becomes apparent. The fore legs are sometimes more or less bandy, but the less the better; there are no dew claws, and the feet are not very strong, having a tendency to flatness and thinness of the soles. Tail long, and carried horizontally, but with a sweep, so that the tip is a little below the level of the back. Weight, from ten to eighteen pounds, the bitches being nearly as heavy as the dogs — perhaps about two pounds less. The colors most fancied are silver gray with black tips, fawn with dark brown tip to the ears and tail, dark slaty blue (slightly grizzled, but without any absolute admixture of white), black and pure fawn — the order we have named being in accordance with the value of each. The hair should be long, straight, and shining, like that of the tail of the horse; any appearance of silkiness, wooliness, or curl to be avoided, excepting on the top of the head, where it has a slight tendency to silkiness. By some fanciers the prick-ear is preferred to the drop, the strains in which this point is shown being stronger in the body, and hardier in constitution and courage. The prick-ear should stand up well, and terminate in a fine tuft of hair coming to a decided point."

There is probably no better Terrier for the destruction of small game and vermin than the short-haired variety, as they are sagacious, hardy, energetic, and courageous, and will plunge into the coldest water in pursuit of game, manifesting the greatest persistence in securing it. Aside from being a game dog, the Skye makes a most useful watch-dog for dwellings at night, always being on the alert to give the warning if there is anything going wrong. They are also very companionable and pleasant in disposition.

The Yorkshire Terrier. — This is another of the Scotch Terrier family. It has a compact, well-formed body covered with long, straight hair. The head is rather large for the body, and the nose sharp. The most desirable of these dogs have three different shades of color, blue, silver, and tan; the tan on the fluff of the head, ears, and legs being of a very rich shade. There is a variety known as the blue-tan Yorkshire, or silk-coated Terrier, which have a coat of a rich blue-tan color that is exceedingly long, silky, and smooth. This is supposed to be produced by a Maltese cross, and is a modern variety somewhat rare.

The Maltese Terrier. — This is a favorite toy dog, and is a complete mass of long, silky hair, the hair being so compact and long as to disguise the outline of the animal. Pure bred dogs of this breed are pure white in color, with a tendency in the hair to curl.

The Italian Greyhound. — These are probably the most elegant and delicate of house dogs. They resemble the English Greyhound in all respects except size, being a perfect miniature of that breed. It is bred in Italy and Spain in great perfection, the warmth of the climate agreeing with its constitution most admirably, as it is very sensitive to the cold. It is bred principally for a toy dog, although it will sometimes catch small game in warm weather. The size most preferred is when the weight is about six or eight pounds. They are deficient in courage, and so sensitive to the cold, that in a cold climate they must not only be well housed, but should be protected with a blanket when out of doors in cold weather. The colors most desired are fawn, blue, or black.

The Poodle. — This is an exceedingly interesting pet, it being very intelligent, and therefore admirably adapted to being taught a large number of tricks. For this reason, showmen who exhibit educated dogs, generally depend upon the Poodle for the performance of

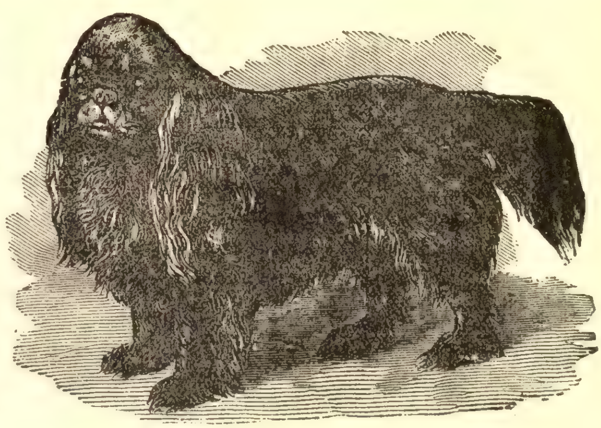
those tricks most intricate and difficult, and it is truly astonishing to what an extent they may be trained.

An English writer says: "With more intelligence than falls to the lot of any other dog, he unites great fidelity to his master, and a strong love of approbation, so that he may readily be induced to attempt any trick which is shown him, and the extent to which he may be taught to carry out the secret orders of his instructor is quite marvelous. He fetches and carries very readily, swims well, and has a good nose, but has no particular fondness for hunting game, often preferring a stick or a stone to a hare or pheasant. Two of these dogs which were exhibited in London astonished every one with their clever performances, sitting upon the table gravely, and playing a game at cards as quickly as a human being, the cards being placed before them, and the one to be played being selected by the dog's foot. Of course this was all done by preconcerted signal, but nevertheless it was remarkably well managed, and showed a wonderful degree of intelligence and discipline.

The Poodle is characterized by a large wide head, rising sharply at the forehead, long falling ears clothed with thick curly hair, rather small eyes, square muzzle, with a liberal allowance of jowl, and a sedate appearance until roused by any prospect of fun; a well-formed pointer-like body, but covered with thick closely curling hair, hanging down in ringlets below; tail usually cropped more or less, naturally covered with crisp curls; legs straight, and covered all round with hair hanging in short ringlets; feet small and round, and moderately hairy; color white or black, or white and black; height from sixteen to twenty inches."

Those pure white in color are generally preferred. We have seen these dogs so trained that two of them would stand erect upon their hind feet, and putting their fore paws upon each others' shoulders, would waltz about the room keeping time to music; also stand on their heads, balance themselves on the back of a chair, resting upon the head with the hind feet in the air, jump the rope, etc.

The King Charles Spaniel.—There are two recognized varieties of the Toy Spaniel, viz.: the Blenheim, and the King Charles Spaniel, which have a somewhat close resemblance, although the latter is the largest, and is considered the handsomer of the two,—if handsome they could be called. The points in the King Charles are: Head round and short; ears long and pendant, well coated, or what is termed "feathered;" eyes large and prominent; nose short with a deep stop—that is, well indented just at the setting in of the nose from the forehead; neck short, well coated; shoulders wide; fore legs short and well feathered; feet long, with good coat between each toe; back compact and short; loin strong; tail carried low, never higher than the level of the back, with plenty of feathers on it; hind legs well feathered also; coat abundant, silky, straight, and glossy; the black pure and very fine; where tanned, rich mahogany color, free from white, a tan spot over each eye, lips tan, and all under parts, with legs and feet, deep rich tan.



KING CHARLES SPANIEL.

The Blenheim varies but slightly from the former except in color, and being of smaller size, the color being always a white ground with red or yellow spots, and a well defined blaze

between the eyes. As a house dog they are watchful, and will bark at intruders, thus giving warning; they however possess but little courage, and do not follow well when out of doors.

The Pug Dog. — This dog is at present quite a favorite as a pet. It is said to be of Chinese origin, and has long been quite common in Holland, where they are much admired. He seems to bear the same relation to the Bull-dog that the Bantam does to the largest breed of fowls. The Pug is sensible, affectionate, and playful, and bears the confinement of the house better than most breeds. The points have been given by good authority, as follows:

General appearance low and thick-set, the legs being short, and the body as close to the ground as possible, but with an elegant outline; weight from six to ten pounds; color fawn, with black mask and vent. The clearer the fawn, and the more distinctly marked the black on the mask, which should extend to the eyes, the better; but there is generally a slightly darker line down the back. Some strains have the hair all over the body tipped with "smut," but on them the mask is sure to shade off too gently, without the clear line which is valued by the fancier; coat short, thick, and silky; head round, forehead high; nose short, but not turned up; and level-mouthed; ears, when cut, cropped quite close, naturally rather short but falling; neck of moderate length, stout, but not throaty; chest wide, deep, and round; tail short, and curled closely to the side, not standing up above the back. It is remarkable that the tail in the dog generally falls over the off side, while in the bitch it lies on the near. The legs are straight, with small bone, but well clothed with muscle; feet like the hare, not cat-footed; no dew-claws on the hind legs. The height is from eleven to fifteen inches.

PUG DOG.

Breeding.—The general principles of breeding adapted to the dog are similar to those of other domestic animals, which have been so fully discussed in a separate department of this work that nothing need be said in this connection, except what applies particularly to the canine race. The following special principles have been derived from the best English and American authorities on this subject: "The best age to breed from, in almost all breeds, is soon after the sire and dam have reached maturity. When, however, the produce is desired to be very small, the older both animals are, the more likely the result is, excepting in the last litter which the bitch has, for this being composed of only one or two puppies, they are not smaller than the average, and are sometimes even larger. All bitches should be allowed to reach fully maturity before they are permitted to breed, and this period varies according to size, small dogs being adult at one year, whereas large ones are still in their puppyhood at that time, and take fully twice as long to develop their proportions. The Mastiff is barely full grown at two years, large hounds at a year and a half, Greyhounds at the same time, Pointers and Setters from a year and a quarter to a year and a half, while Terriers and small toy dogs reach maturity at a year old, or even earlier.

The best time of the year for breeding dogs is from April to September, inasmuch as in the cold of winter the puppies are apt to become chilled, whereby their growth is stopped, and some disease very often developed. The toy dogs, and all small dogs which are reared in the house, may be bred at almost any time of the year; but even they are stronger and healthier if born in the summer months, because the puppies may then be supposed to get more air and sun than they could in the winter, when the warmth of the fire is essential to

their well-doing. Most female dogs will breed twice a year at regular periods under favorable circumstances, but individuals vary in this respect, the period of oestrum occurring in some every four or five months, in others every seven, eight, nine, ten, eleven, or twelve months; but with the larger proportion it occurs twice a year quite regularly. The time between the first and second periods will generally indicate the length of time intervening between succeeding ones.

During parturition do not meddle unless the time of birth be protracted considerably. When assistance is necessary, it should be done in the most careful and gentle manner, so as not to injure either the mother or offspring. Keep her warm and feed on light, easily digested food, such as soup, mush and milk, etc. She should be given some cooked meat every day while suckling her puppies. If her appetite fails at this period, she will be apt to become very weak and emaciated. If the teats or any part of the udder become sore or or swollen, bathe in warm water several times a day, and when dry rub well in the following lotion: one ounce of gum camphor well mixed with four ounces of olive oil. If the puppies should die, the inflammation of the udder should be kept down by milking the teats carefully two or three times a day. The puppies may be weaned at from five to six weeks of age.

Period of Gestation.—The reproductive power in dogs generally lasts eight or nine years; the number of offspring produced at a single birth varying with different breeds, but with most breeds averaging five or six, the average period of gestation being sixty days, the shortest period fifty-five days, and the longest sixty-four days.

General Management of Dogs.—Dogs should have good care and kind treatment in every respect. There are many persons owning a dog who, without intending to be at all cruel to the animal, but through lack of thought or on account of indifference, fail to give him that considerate and kind treatment that he should receive. Perhaps he is not provided with any shelter in cold, stormy weather, while the amount and quality of food is scarcely sufficient to keep him from starvation. When we add to this that he is frequently tied to a short chain most of the time, and never permitted to have the exercise that is essential to his health, and too often under such circumstances, has an insufficient supply of water, which is generally warm or otherwise unfit to drink, it is no wonder that the poor faithful animal either sickens or dies, or becomes morose and peevish.

In order to be healthy and useful, dogs should be well and regularly fed. A half-starved dog is not half a dog in any respect. Before being weaned it is well to commence feeding the puppy a little with milk that is slightly sweetened with sugar. When first weaned, he should be fed as many as four times a day with milk, or perhaps once or twice a day instead, milk gruel thickened with wheat flour or cornmeal, occasionally giving him small scraps of cooked meat, boiled potato, etc. When three or four months old he should be fed three times a day, changing his diet somewhat, but making oatmeal and cornmeal pudding from water in which coarse meat has been boiled, the principal food, allowing him the bones to gnaw and some of the meat. After he is six months old he may be fed with this, and table scraps, such as meat, potatoes, corn bread, biscuit, etc. Clean, fresh water should be within his reach at all times, and an abundant supply of it.

The house dog should be regularly cleaned. This he requires as much as a horse. A dog that is washed thoroughly at least once a week, using soap, will not be much troubled with fleas. Wash with soap and water, carefully rinsing out all of the soapy water from the coat. They should also be brushed once a day. The membranes of the toes sometimes get sore. When this occurs wash carefully with soap and water, and apply cosmaline. With good and suitable food regularly given, a plenty of clean, cool water, cleanliness, and a sufficient amount of exercise, a dog may not only be healthy and serviceable to his master, but be a happy animal as well, which is the only condition that will secure the best service from him.

Exercise.—The dog is naturally an active animal, and will suffer if not permitted to have a sufficient amount of exercise. The young dog must have exercise from necessity, while the old dog will soon become absolutely worthless without it. In fact we never knew a puppy that was kept confined that ever became a fine dog. The practice of keeping a dog chained most of the time is a cruel one, besides it will make the animal thus treated sullen, ferocious, and stupid, and about as worthless as a wild brute. When necessary for any purpose to keep a dog chained for a limited time, be humane about it and give him sufficient length of chain to admit of some liberty and exercise.

A recent writer recommends the following sensible method of securing this: "If want of space or the arrangement of the lawn, flower beds, and garden make it necessary to chain your dog, you can give him far more liberty than a common dog chain will allow, by a simple method, and still secure your dog within certain bounds. This device consists in planting two stout, short posts, one by the kennel and the other one from twenty-five to fifty feet from

LAYING DOWN THE LAW.

the first. Stretch a stout wire (old telegraph wire will answer the purpose nicely) from one post to the other and secure it firmly, first running it through the end of the dog chain. The dog will soon understand how to make use of this apology for liberty, and will frequently exercise himself 'up and down the line.' We advise all who keep a dog, and are obliged to keep him on the chain most of the time, to try the above plan, and the dog will thank you for the kindness in many ways. Give your dog daily attention, not merely enough to eat and at regular intervals, but give him fresh water daily, and change his 'run,' when necessary, so as to afford him an opportunity to have his run or exercise on the grass instead of the hard, compact soil."

Dog Kennels.—Dogs need shelter as well as human beings, and should always have it. It is true that nature has supplied most breeds of dogs with a warm covering, which affords

ample protection under most circumstances, yet at night and in cold or stormy weather they should be provided with shelter. They should have a well built dog-house, which is amply supplied with clean, dry straw for bedding, rye straw being the best for the purpose. This should be changed sufficiently often to keep the bed clean and comfortable. In making a dog-house make it large enough for comfort, perfectly rain-proof, and sufficiently tight for warmth, not forgetting to have ventilation so arranged that the air of the kennel can be kept pure without exposing the animal to a draft of air. There should be a broad floor, with cleats or blocks underneath to raise it from the damp ground, thus securing it from dampness, otherwise there will be a liability of the animal contracting rheumatism and other diseases to which canine flesh is subject. White pine is a cheap, light wood for building a dog kennel, and is also the most easily worked.

Training Dogs.—Dogs should be trained according to the purpose for which they are to be used, for without proper training a dog is comparatively of but little value. Obedience should be the first lesson in training, and this should commence early. When this has once been learned, the remaining part of the dog's education is merely the result of patience and practice. In order to secure prompt obedience, it is not necessary to practice severity, much less cruelty. The experience of the best trainers proves that the less one uses the whip, the better the dog. When a pleasant tempered, intelligent dog once understands what is wanted of him, he will generally be pleased to do it, if praised for his obedience and preference, with perhaps at first a reward with some choice bit that he prizes. When obstinate, which is very rarely the case, obedience must be secured by sterner measures, but we would not recommend punishment except in rare cases, such as those of willful disobedience.

Many otherwise valuable dogs have been rendered worthless by cruel and severe beating, often, perhaps, when they did not understand what it was for, and thus have had all the courage taken out of them. Kindness and praise will accomplish much more than blows and harsh words, and will have a tendency to improve upon all his desirable qualities, while severity and cruelty has, as a general result, the opposite tendency. In training to carry, take a small stick, and after handling it, let him smell it; then allow him to take it in his mouth; afterward throw it on the ground a short distance; and tell him to bring it to you. If he does so, pat him and give him words of praise, with a bit of something that he likes, or perhaps the praise will be a sufficient reward with some animals. Then throw it a little further off, and have him find and bring it to you, always allowing him to see you throw it.

In this way an intelligent dog can be very soon taught to carry game, and even live birds, without harming them. Dogs can be taught to perform any trick within their capacity, by kindness and patient effort, always rewarding them in some way, either by caresses, praise, or some choice bit, to show your appreciation. Mr. J. K. Felch states that a Collie puppy four months old was trained to carry a newspaper from the store to his master's house, going to the store and asking for it with a sharp bark; at one year old he would go from the factory to the house, or house to the factory, with a note, waiting an answer, and return. He would go to the store for the paper, and if told "*it is not here*," would go to the owner's father for it before returning to the house, for the reason that some of the family sometimes went over to get it to read in the meantime. He would shut the door when told to do so, bring your cane, hat, slippers, gloves, or paper by sending him for them by name, all of which he learned without once being punished.

Training Shepherd Dogs.—The following directions for training shepherd dogs, given by Dr. N. H. Paaren, will be found of great value to those desiring such information: "Most men professing to train young Collies display much ignorance of the nature of the breed, and of the aptitude of the particular individual for its peculiar work; and hence many

dogs are made unfit for useful service. Every Collie pup has a natural instinct for work among sheep, nevertheless pups should be trained with an old dog. Their ardent temperament requires subduing, and there is no more effectual way of doing this than keeping them in company with an experienced dog. A long string attached to the pup's neck, in the hands of the shepherd, is often necessary to make it become acquainted with the language of the various evolutions connected with work.

With this contrivance he may learn to "Come in!" "Come in behind!" "Lie down!" "Be quiet!" "Speak to them!" "Get over the fence!" He will, if due patience and constancy is exercised, learn all these terms, and others, in a short time. The bitch is generally more acute in learning than the dog, and is not so apt to be lazy, though the dog will bear the greater fatigue. The quietly-disposed shepherd mostly prefers the bitch, and is chary of working her when in pup.

The best time to begin the training of a pup is about the sixth or eighth month of its age. When a year old or more, before his training is begun, he will never amount to much. The most sensible and easily trained pups are those which are got by pure-bred and well-bred parents, and from well-broke ancestors on both sides of the kennel. A Shepherd's dog takes as much pleasure in driving sheep as some curs do in following a wagon; and it is as natural for a Shepherd's dog to run back and forth behind a flock of sheep as it is for a setter to raise his forefoot at the sight of game; but beyond this they have to be taught. Before taking the young dog into the field, he should be perfectly familiar with you. He should know his name, and mind you when called upon. If he is not attentive, or does not come immediately, speak sharply to him, or lightly box his ears, but never jerk him by them; practice this until he will come at your bidding, even if he knows he is to get a flogging. Never punish the dog unless he knows why he gets punished. Do not whip him before you are satisfied whether he understands your order, or whether he disobeys from unwillingness.

All orders should be accompanied by a motion with the hand in the direction you wish him to go. If he does not come when called upon, or refuses to go in the direction you send him, continue to give the same order, and make the same motion until you can get up to him, and then punish him, if he deserves it. Never let him go without correction when he disobeys, and then, an hour after, when he has forgotten all about it, whip him because you have finally got hold of him, and are angry. In order to give your dog confidence in you, and make him attached and obedient, your conduct should be such as to make him think you a right good fellow. A few whippings may possibly be necessary with certain dogs in the course of training, but the whippings should be few and far between, and always with moderation, and with a feeling of due regard for humanity; otherwise your dog is apt to become dogged, morose, sullen, and a coward.

The rudiments of training of a Shepherd dog consist in bringing him to promenade back and forth from one side of the flock to the other at the motion of your hand. The next step will be to have him pass up the side of the flock — yourself and the dog supposed to be at the rear of the flock. Your dog is supposed to be conversant with the meaning of this motion of your hand and arm; so when you point forward with your left hand and arm, you must continue calling out the words, 'Away up!' until he gets hold of your meaning, and goes up along the left of the flock. Having nothing else to do, exercise your patience and improve your voice by a constant reiteration of your commands — always throwing your arm out, as you would in directing a man who was beyond the reach of your voice. Idleness is the progenitor of laziness and vice, wherefore, in order to prevent your pup from acquiring either of these habits, keep him constantly occupied, by putting in almost your entire time in making him do something, provided, of course, that you do not worry the flock or tire your dog too much. By degrees, the dog will be urged up towards the head of the flock, and partly

around. While there, change your position at the rear of the flock, towards the right — supposing you were at the left, and your dog had been sent upon along the left side — and call him down towards you along the right side, by making a motion towards you, and crying 'Come in!'

A sweep of the arm from the side you wish him to start to the other, is the proper motion, when you want him to go ahead and around them, and the motion should be accompanied with the cry 'Around them!' It requires some time and patience to bring the dog up and ahead of the flock. It will come by degrees; and if your pup is possessed of some good, hard dog sense, it will not take him long to know that 'Up! Away up!' means that he shall go for the head of the flock. Always call his name in giving any order, and always make the motion with your hand. If he does not quite understand your meaning, he will most probably stop on his way up and look around at you, to see what comes next, when you must repeat your motion, and cry, 'Up! Away up!' until he goes ahead.

If you are driving a flock along a fenced road, or in a field along a fence, and you want your dog to go ahead of them, get over the fence yourself, and motioning and calling the dog, 'Over and up!' he will mount the fence, when he fathoms your meaning, and go ahead inside the fence, or outside, as directed. If you want him to stay at a certain place, away from you, teach him to 'Stop there!' or 'Lie down!' If you wish to go ahead of your flock yourself, and have the dog remain behind, go ahead along one side; and if the dog wants to follow you, drive him back with threatening motions, and the words 'Go behind!' and when he has got back to place, keep an eye on him, and say occasionally 'Drive them up!' and 'Speak to them!' By practicing this a short time on a fenced road, the dog can be taught to bring the flock up after you, in whatever direction, even on a wide field.

It is not desirable to have the dog barking much of the time. You must teach him to 'Keep quiet!' and to 'Speak to them!' In order to make him speak to them whenever you wish him to, make a big fuss yourself, and so get him excited, when, by singing out 'Speak to them!' you can set him barking. This is especially desirable when he is bringing up the rear, when crossing a railroad, driving them over a stream, or into a yard. In training a dog, a shepherd must be careful in not letting him get the habit of crowding the sheep too much, whether they are on the move or are grazing in the field. Some Shepherd dogs acquire the habit of taking hold of the legs of the sheep, whereby the skin is apt to break, if the wool is not of some length. If the dog is trained to catch any sheep that is pointed out to him, he should be taught to take hold at the side of the neck near the shoulder, not at the ear, and least of all, at the throat.

In Texas, they have a way of training dogs with sheep. A pup is taken from its mother before its eyes are opened, and put with a ewe to suckle. After a few times the ewe becomes reconciled to the pup, which follows her like a lamb, grows up among, and remains with, the flock; and no wolf, man, or strange dog can come near the flock of sheep; and the flock will follow the dog to the fold regularly at half-past seven P. M., if you habitually feed him at that time.

It would be quite possible to cause the dog to perform all his duties by means of the motions of hand and arm alone, and without words, but the voice keeps up an understanding between the man and the dog, and helps to while away many a long hour. Too much use of the voice, however, is apt to make the dog unmindful and regardless of it. As to the names of dogs, they should be *short and emphatic*, not exceeding two syllables, for long names are difficult to pronounce when quick action is required.

Most young Shepherd dogs make a great noise, bustle about in an impatient manner, or run fiercely at the sheep, biting their ears and legs, and they generally overdo their work. Great harm may accrue to sheep by allowing the dog to work in these ways. Whenever sheep hear a dog bark that is accustomed to hound them every day, they will instantly start

from their grazing, gather together, and run to the farthest fence, and a good while will elapse before they will settle again. And even when sheep are gathered, a dog of high travel, and allowed to run out, will drive them hither and thither, without any apparent object. When a dog is allowed to run far out, it gets beyond the control of the shepherd; and such a style of working among wether sheep, puts them past their feeding for a time; with ewes it is very apt to cause abortion; and with lambs, after they are weaned, it is apt to overheat them, induce palpitation, and a considerable time will elapse before they recover their natural breathing."

A Shepherd dog should be taught to keep quiet unless ordered to bark, by saying "Speak to them!" and should be also trained to bark when thus directed. Barking is seldom necessary, except when penning sheep, when sometimes a quick, sharp bark will do more towards getting the leaders of the flock in, than continued barking would. Give him short and easy lessons, being sure that he thoroughly understands one before giving him another, otherwise he will become confused in his teaching. Always demand obedience to all calls, giving him daily lessons, and using invariably the same signs and calls, so that he will be able to understand them, giving him at all times kind and just treatment.

Training Pointers and Setters.—The methods adopted for training Pointers and Setters are identical. These dogs are very intelligent, and consequently quick to learn, if the trainer fully understands his business, and has sufficient patience and perseverance essential to success. Severity and cruelty are too often practiced by professional trainers, and for this reason it will usually be better for the owner to train his dog himself. Kindness and firmness are the best rules to abide by in training, remembering that in such cases as well as with the Collie, those dogs that are punished with the whip the least, are, as a general rule, the best; but if an animal is stubborn and willful, obedience must be enforced with the whip, but never with the ramrod or gun.

Always give the commands in the same language, otherwise they would not be understood. The words of command commonly used in the field, and which are consequently taught Pointers and Setters, are as follows: To avoid breaking over a fence or other barrier, "Ware fence;" to return from chasing hares, poultry, etc., "Ware chase;" to come and walk quietly behind the master, "To heel," or "Heel;" to run or course forward, "Hold up;" to lie down, "Down charge," or "Down;" to prevent taking food placed near, or to prevent running in on birds, "Toho." If the dog is not easily managed at first, being too full of spirits, it will be well to attach a light cord to his collar that is twenty or thirty feet long, and let it trail behind him; this will soon quiet him down. No puppy should be taken into the field until these orders are all fully understood, and promptly complied with in training. Field dogs should be well trained to the gun.

A good English authority says: "Punishment is not to be condemned altogether, for in some breeds and individuals without the whip nothing could be done; but it should be very cautiously applied, and the temper of each dog should be well studied in every case before it is adopted. Kindness will effect wonders, especially where united with firmness, and with a persevering determination to compel obedience somehow; but, if that 'how' can be effected without the whip, so much the better; still, if it cannot, the rod must not be spared, and, if used at all, it should be used efficaciously.

Shyness of the gun will generally also pass off in time; but, as it seldom occurs, except in very timid and nervous dogs, they do not often become very useful even when they have lost it. The best plan is to lead a shy dog quietly behind the shooters, and not to give him an opportunity of running off, which he generally does on the first discharge. When game falls, lead him up and let him mouth it; and thus, in course of time, he connects cause with effect, and loses that fear of the report, which he finds is followed by a result that gives him the pleasure of scenting fresh blood.

Retrieving. — Few Pointers and Setters will carry game far, nor indeed is it worth while to spend much time in teaching them to do so; and when they are set to retrieve, it is better to follow them, and help them in their search, so as to avoid all necessity for developing the 'fetch and carry' quality, which in the genuine retriever is so valuable. But it is chiefly for wounded hares or running pheasants that such a retriever is required; and as the former spoil a Pointer or Setter, and are sure to make him unsteady if he is allowed to hunt them, it is desirable to keep clear of the position altogether, while pheasants are so rarely killed to these dogs that their retrieval by them need not be considered.

The regular land retriever requires much more careful education, inasmuch as he is wanted to abstain from hunting, and from his own especial duties, except when ordered to commence. The breed generally used is the cross of the Newfoundland with the setter or water-spaniel, but, as I have explained in another place, other breeds are equally useful. In educating these dogs, they should be taken at a very early age, as it is almost impossible to insure perfect obedience at a later period. The disposition to "fetch and carry," which is the essence of retrieving, is very early developed in these dogs, and without it there is little chance of making a puppy perfect in his vocation. Young dogs of this breed will be seen carrying sticks about, and watching for their master to throw them, that they may fetch them to him.

This fondness for the amusement should be encouraged to a certain extent almost daily, but not so far as to tire and disgust the dog, and care should always be taken that he does not tear or bite the object which he has in charge. On no account should it be dragged from his mouth, but he should be ordered to drop it on the ground at the feet of his master, or to release it directly when it is laid hold of. The consequence of pulling anything out of the young retriever's mouth is that he becomes "hard bitten," as it is called; and, when he retrieves a wounded bird, he makes his teeth meet, and mangles it so much that it is utterly useless. A dog which is not naturally inclined to retrieve may be made so by encouraging him to pull at a handkerchief or a stick; but such animals very seldom turn out well in this line, and it is far better to put them to some other task. As soon as the puppy has learned to bring everything to his master when ordered, he may be taught to seek for trifling articles in long grass or other covert, such as bushes, etc.

When he succeeds in this, get some young rabbits which are hardly old enough to run, and hide one at a time at a little distance, after trailing it through the grass so as to imitate the natural progress of the animal when wounded. After putting the young retriever on the scent at the commencement of the "run," let him puzzle it out, until he finds the rabbit, and then make him bring it to his master without injuring it in the least. Encouragement should be given for success, and during the search the dog should have the notice of his master, by the words: "Seek!" "Seek!" A perseverance in this kind of practice will soon make the dog very bright in tracing out the concealed rabbits, and in process of time he may be entrusted with the task of retrieving a wounded partridge or pheasant in actual shooting. But it is always a long time before the retriever becomes perfect, practice being all important to him."

DISEASES OF DOGS.

Care of Sick Dogs.—Sick dogs, like sick people, should have kind and considerate care. They should be kept warm, quiet, away from all noise and harsh words, and their kennels kept clean and well ventilated. Dr. A. J. Sewell, member of the Royal College of Veterinary Surgeons, gives the subjoined directions for nursing sick dogs: The successful treatment of our canine friends in severe cases of illness is one of those subjects which are too often neglected. And yet, if dog owners truly value the lives of their dumb companions, every possible care should be taken of them. The diseases which affect the dog are numerous, and it is not only in cases of dangerous and severe diseases that treatment is necessary, but also in cases of skin diseases. In these complaints much depends on the daily food supplied to affected animals, if we are to insure a successful and speedy termination of the affection. However scientific and proper the doctoring may be, if it is not aided by good and careful nursing, the veterinary surgeon's skill is all lost.

A person requires a large amount of patience to be a good nurse, for a harsh word to a dog badly affected with distemper will sometimes induce fits, and these, once established, more often than not prove fatal. It is my purpose to draw attention to the general management of sick dogs, and then direct special attention to the nursing of dogs affected with specific diseases, such as distemper, jaundice, etc.

I have been frequently requested to visit dogs affected with distemper, and on arrival, have found the patient chained to a kennel containing no straw or other litter, and in a yard paved with stones. With such treatment, dogs are often the subject of inflammation of the lungs, the result of exposure, besides being affected with distemper. When a dog is noticed to be ill, it should (if with other dogs) be removed to a room or kennel-house where it will be alone. He may not only affect others, but they will annoy and tease him, and so interfere with the patient making progress. The hospital should be warm (not hot) and well ventilated, free from all draughts, and the thermometer be kept as near as possible at 55° Fahrenheit. A basket or box should be supplied for the dog to lie in. The bottom should be covered with straw or hay—the former is best, as dogs lying on hay for any length of time, as a rule, become infested with fleas. Besides, as straw is cheaper, it may be changed daily, which is essential, as it adds to the comfort and cleanliness of the patient.

A large dish or pot of cold water should be placed within easy reach of the dog, and ought to be changed twice a day to insure its being fresh and cold. There are some cases where cold water is injurious, but these are rare. All evacuations from the patient should be immediately removed, and a little disinfectant fluid sprinkled about. The sick dog should be kept quiet, and by no means exercised. I have often witnessed a fatal relapse in distemper, the result of a few minutes' exercise. I have known persons—when a dog has had a prolonged attack of illness, and become rather offensive—put him in a bath, and wash. On no account should this be done, as it is most dangerous, more especially in the case of long-coated dogs, as these are very difficult to dry thoroughly. If left at all damp, the animals are liable to become chilled, and the disease is aggravated.

A dog, when very ill—say from distemper—should not even be brushed or groomed, as it excites and disturbs him, and increases the weakness, which is always great in this disease.

Administering Medicine to Dogs.—To have their proper and desired effects, medicines should be given regularly, and at stated times, and not as some persons do, to give a double dose because they forgot one. I have known this to be done repeatedly, and wish to warn owners of its fatal consequences. The medicine should be given quietly, and without disturbing the dog, if possible. One person, as a rule, is sufficient to give it if a little tact is

manifested. If it be liquid medicine, it is best given out of a small vial, one which will hold about an ounce. In administering medicine the person should stand in front of the dog, and with the left hand the muzzle of the animal should be held, the head slightly elevated, and the teeth kept nearly closed. The bottle containing the potion should be held in the right hand, and the neck of it placed within the lips on the left side of the face, between the teeth and cheek. Then small quantities should be poured into the mouth, and on no account should a second quantity be given until the first has been swallowed. Some dogs are rather obstinate in taking medicine, and hold it in the mouth some seconds before swallowing. Under these circumstances many people pinch the throat, with the idea of inducing the dog to swallow.

This act is dangerous, as it often makes the patient cough, and, with the fluid in the throat, sometimes choke from drawing it into the windpipe. All that is necessary, in most cases, is a little patience to keep the dog's head elevated, and he will soon swallow. In very obstinate cases the end of the nose may be pinched, which soon compels the dog to perform the act of deglutition. To give a pill or bolus, the upper part of the muzzle should be grasped, and the lips pressed between the teeth. This forces the mouth open, and it remains so, because the dog is afraid of biting himself. The head should then be elevated, and the pill or bolus dropped into the back of the mouth. The mouth must then be immediately closed and held until the dog has swallowed."

Abscesses and Tumors.—These occasionally occur in dogs that are weakly, and whose constitutions have been debilitated by disease, or from an impure condition of the blood. They generally come around the jaws and throat, and afterwards come to a head and break, discharging a watery pus. They may be hastened in coming to a head by poulticing; when soft, they may be opened, after which they will run for a few days before healing. After opening, inject two or three times a day a lotion of two drachms of carbolic acid, mixed with one pint of water. If the dog is in a debilitated condition, give every morning and night for a few days the following powder: two grains of sulphate of iron and three grains saltpetre. Keep clean, cold water in his kennel, where he can have constant access to it, and give a variety of food.

Chorea.—This is a nervous disease quite common to dogs, and is occasionally accompanied by fits. It is characterized by a quick, nervous jerking of any portion of the body, generally the head, neck, and fore parts, it sometimes being located in one leg or shoulder, and sometimes the entire body. In the latter case the dog is generally utterly useless. This disease frequently follows the distemper. A tonic given when a dog has been debilitated by any disease will usually prevent it; but when once fully developed, it is incurable. It is sometimes caused by worms, and when this is suspected to be the case, give simple worm remedies for their removal. Beyond this the general health must be improved. The following is a good tonic, which may frequently be found of valuable service: Sulphate of zinc, three grains; extract of gentian, two grains; mix and give as a pill night and morning. Careful attention should be given to the state of the bowels, an unnatural looseness or constipated condition being alike injurious.

Constipation.—Although not exactly a disease, yet a constipated condition of the bowels often leads to disease, or is the direct result of it. This difficulty is quite common with dogs, being frequently caused by too much meat diet, with too little exercise. An injection of lukewarm water will sometimes remedy the evil; but if this is not effected, give castor oil. For a large dog a half ounce of the oil will be necessary, to be repeated in about ten hours if the first does not have the desired effect. For small dogs the dose should be lessened accordingly. If the case be an obstinate one, increase the dose. It is also well to use the injection in connection with the dose. Feed on a mixed diet, such as table scraps, mush

and milk, oatmeal and cornmeal pudding, vegetables, soup, etc. Instead of continually dosing a dog for this difficulty, add oatmeal and corn mush to his diet, together with vegetables; boiled liver, cooked rather rare, is also good for dogs under such circumstances, fed two or three times a week.

Diarrhœa and Dysentery. — Unless judiciously checked, diarrhœa will be apt to run into dysentery. The latter may be distinguished from the former by blood being mixed with the excretions, great straining, pain, dejected countenance, and redness of the rectum. To regulate the bowels, give a mild dose of castor oil, giving as a diet mutton soup, wheat bread and boiled milk, or boiled milk thickened with cracker, rice, oatmeal, etc., avoiding corn meal mush, which is loosening to the bowels. Where the symptoms are those of dysentery, to a medium-sized dog give a tablespoonful of the following mixture: Castor oil, 3 ounces; laudanum, 2 ounces; tincture of ginger, 2 drachms, with frequent injections of warm water. The animal should be kept perfectly quiet, and fed on rice water thickened with arrowroot, scalded milk, mutton broth, and oatmeal gruel.

Distemper. — This disease often proves fatal to dogs, and requires judicious management. It is generally supposed that it is similar to the typhoid fever in man, and is the result of blood poisoning, the germ of the disease being admitted from without, or developed within the blood, by which means the secretions of the body are either checked entirely, or so changed as to no longer purify the system. The symptoms are languor, loss of appetite, redness of the eyes, nose hot and dry, urine high colored, pulse feverish, breathing rapid, shivering of the body. The bowels will sometimes be constipated and sometimes loose, the discharge being of a fetid nature. About two days after the attack the eyes and nose begin to have a watery discharge, a cough sets in, and there are symptoms of pneumonia; the tongue becomes coated, and there is a high fever, frequently accompanied with delirium and great weakness. The nostrils sometimes become so filled with a discharge as to prevent breathing through the nose, and the eyes so sore as to cause a partial blindness. When the seat of the disease is in the bowels, a violent diarrhœa is the result, which frequently proves fatal; when the brain is much affected, fits will generally be the result. Sometimes the skin is affected; in such cases pustules will appear on the inside of the thighs, fore legs, and on the belly. Dr. Sewell recommends the following treatment for distemper:

"The rules for the general management of sick dogs must here be observed, and then attention may be directed to diet. The first week the diet should be entirely of a fluid nature, as weak mutton broth or beef tea; and, if these are refused, milk may be offered. After the first week, when the dog is very weak, bread or biscuit may be added to the broth or other liquid food, which may now be given stronger. At this period of the disease the dog often refuses all nourishment. On those occasions it should be drenched with it — that is, given it out of a bottle as in medicine. The beef tea, if the dog is very weak, should be thickened with arrowroot, and a small quantity of port wine added. A fresh egg, well beaten up with a little brandy, may be given occasionally for a change. The food should be offered in small quantities every two hours. About the end of the third week, if the dog is progressing favorably, and the fever diminished, the diet may be increased. In addition to the beef tea and broth, small quantities of meat, such as mutton or beef (the former preferred), may be allowed. It is more serviceable when rather under-cooked. Should this cooked food be refused, raw meat is readily snatched up by some animals. Sheep's paunches, well cleansed and boiled, are frequently relished by a dog at this period, and may be given with safety, as they are easily digested. Large quantities of any kind of food should not be offered at a time, but rather small quantities every three or four hours. The quantities may be gradually increased as the patient improves and gains strength.

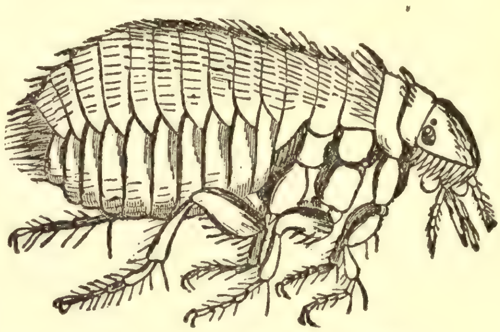
Distemper is often accompanied with a bad form of diarrhœa, which, if not stopped, quickly proves fatal. A judicious diet greatly assists in stopping the purging. If beef tea is

given, it should be thickened with gelatine; or, if milk, it ought to be first boiled, but not given until cold. The meat of boiled rabbit is a capital thing for dogs suffering from diarrhœa during this complaint; and biscuits made of arrowroot, of which dogs are very fond, will be found exceedingly useful. I do not think it out of place to again remind dog owners that in this disease great attention should be paid to ventilation, and other sanitary arrangements of the kennel."

When the lungs are affected, apply a mustard paste directly over the lungs, putting on a blanket to confine it in place.

Fevers. — (See DISTEMPER.)

Fits. — These are quite common to the canine race, and arise from different causes. They are divided into three classes, viz.: Convulsion fits, or those arising from irritation; those of the nature of apoplexy, accompanied with a pressure of blood upon the brain; and those of an epileptic nature. The first are common to puppies, and are generally produced by the irritation caused by teeth-cutting, which occurs in two periods, which are during the first month, and from the fifth to the seventh month. They usually come suddenly, the puppy lying on its side, the body being more or less convulsed. There will be no foaming at the mouth, it in this respect differing from epilepsy. The recovery is gradual. The best treatment recommended is a warm bath, followed by rubbing with a dry cloth, afterwards keeping the animal warm. In apoplectic fits the dog lies insensible, or nearly so, does not foam at the mouth, but breathes heavily and snores. Bleed slightly from the neck vein, afterwards purging with castor oil. Sometimes a seton is inserted in the back of the neck, but the attack is generally fatal. Sometimes these fits are caused by worms; in such cases, remove the worms, and the fits will cease. Epilepsy is characterized by blueness of the lips and gums, and by champing of the jaw and frothing of the mouth. These may occur at any period of the animal's life. The fit comes on suddenly, without any warning, and is common in sporting dogs, especially when at work on a hot day. Give the animal a full dose of castor oil; after half an hour give a table-spoonful of the following every two hours until the oil operates: Two drachms bromide of potash, mixed with six ounces of water. When worms are the cause, the treatment should be given at once for these.



DOG AND CAT FLEA, MAGNIFIED.

Fleas. — Dogs and cats are greatly worried by these troublesome parasites. They can, however, be very easily removed. Dust Persian insect powder, or pyrethrum, down into the roots of the hair to the skin; also under the fore legs, and the under side of the body. The same should also be dusted over the carpets, and about the floor and bedding of the dog kennel. Another method is to make an ointment of one ounce of oil of anise, well mixed with ten ounces of olive oil. Rub it well over the entire body, and allow it to remain five or six hours, after which wash thoroughly with soap and water, and rinse with clean water.

Fractures. — When the bones of a dog become broken, set them straight as carefully as possible; wrap in a soft flannel bandage or thin cotton batting, and apply light splints, somewhat pliable, one in front, back, and on either side; then wrap in starched bandages sufficiently light to keep the splints in place, but not too tight to prevent circulation. Wet the blankets thoroughly with a solution of tincture of arnica and water. Leave the splints on about four weeks, which will give the bones time to knit together.

Goitre. — This disease is an enlargement of a gland situated on the side of the neck, called the thyroid gland. It sometimes swells to such an extent as, by pressing upon the windpipe, to interfere with the breathing. Sometimes the glands on both sides of the neck become involved. Paint once a day with the tincture of iodine, or, instead, rub once a day with the following ointment, viz.: Two drachms iodide of potash, two ounces of lard, well mixed. By daily applications of either remedies, the swelling will usually disappear in four or five weeks.

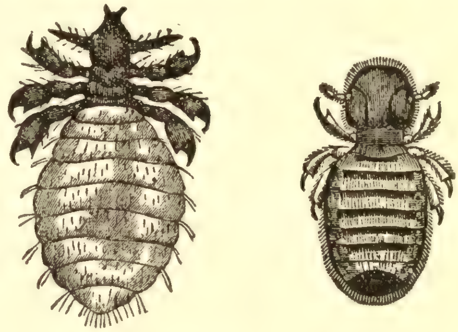
Hydrophobia, Rabies, or Madness. — Some writers consider this disease in the dog as consisting of two varieties or phases, viz.: The dumb, and the furious rabies, according as the animal is silent and undemonstrative when suffering from it, or noisy and ferocious. Hydrophobia is generally first manifested by uneasiness, restlessness, and irritability of temper; the dog that was formerly fond of being petted and pleasant in disposition becoming surly and shy, retreating to secluded places, like a dark corner of the room, under furniture, or the farther part of his kennel by himself, which he will soon leave for another equally secluded place. The appetite becomes depraved; the countenance shows an anxious, appealing expression, and sometimes very ferocious. The animal snaps at imaginary objects, or bites anything that comes in his way, even the boards of his kennel. In the early stages there is frothing at the mouth, which, however, soon becomes thick and glutinous as it lessens in quantity; there is also a twitching of the muscles of the face. Fever is always present to a greater or less extent. This disease is generally characterized by a dread of water, and sometimes by extreme thirst. After a time the gait beccmes unsteady and tottering, and finally paralysis ensues, first of the hind quarters, and then of the whole body, when death finally gives relief. The duration of this disease rarely exceeds ten days, and sometimes death ensues in forty-eight hours. As to the length of time elapsing between the bite from a rabid animal and the development of the disease, nothing definite has been determined, it sometimes being several months, and often but a week or ten days.

No effectual remedy has yet been discovered, and when the symptoms of the animal indicate the disease it will be well to take the precaution of confining the animal where he can have comfortable care, yet will not be able to harm anyone. Fits should not, however, be mistaken for hydrophobia, and a valuable animal be thus unnecessarily killed.

Inflammation of the Bowels. — This may be produced from various causes, such as eating food that would cause irritation of the stomach and bowels, such as acrid, caustic substances, constipation; also from poisons, lying on the cold ground, etc. The symptoms are those similar to other animals affected with it, such as great pain, uneasiness, fever, and soreness in the bowels. The dog will whine and manifest great uneasiness, frequently getting up and lying down, rapid pulse, high fever, rapid breathing, constipation, and soreness manifested in the bowels by slight pressure upon the sides. Give a full dose of castor oil with a tablespoonful of olive oil in it; also warm water injections frequently, until the bowels move. Apply to the bowels cloths wet in warm water, in which a tablespoonful of mustard has been dissolved. This will draw the blood to the surface of the body, and reduce the internal inflammation. Good nursing will prove more effectual than nostrums. Give light food, such as mutton broth, oatmeal gruel, milk, etc.

Jaundice. — This is sometimes called the "Yellows," and is characterized by a yellow tinge to the white of the eyes and skin, loss of appetite, a dry, hot nose, and a feverish condition of the body generally. If he refuses food, do not urge it upon him, except it be a little beef tea, or weak meat broth of some kind, or milk and water, to which may be added a small quantity of lime water. Place them within reach of the patient, where he can help himself whenever he desires. Plenty of fresh, cold water should also be kept near him, as he is generally feverish, and will consequently be thirsty. A dog with this disease should be brought back to his usual diet gradually, or a relapse of the symptoms will occur.

Lice.—There are two kinds of lice that live upon the dog, viz.: the blood-sucker (*oemetopinus*) which has a narrow, long head, and a strong sucking tube, and the bird louse (*trichodectes*). The latter has a large, broad head, and strong biting jaws, but differs from the latter in having no sucking tube. These parasites may be exterminated by sifting pyrethrum powder into the hair, or by the use of a wash of tobacco tea. The application of oil, as recommended for fleas, is also excellent for this purpose.



THE BLOOD SUCKER. THE BIRD LOUSE.

Mange.—This disease is caused by an insect that burrows in the skin, causing intense itching. The animal will scratch so constantly that bare patches will be worn off his coat. This itching generally makes its first appearance around the eyes, on the elbows, fore legs, on the flanks, and down the inside of the thighs, soon after spreading all over the body. The eruptions produced are reddish with scaly patches between the pimples, and loss of hair. Mange is contagious, but ill-fed dogs with filthy surroundings are more apt to have it than others. Wash the animal thoroughly with soap and water to remove all the scurf and scabs; when the coat is well dried rub thoroughly into all the parts affected an ointment made of equal quantities of sulphur and lard well mixed. Apply daily, washing the coat thoroughly after the fourth day. In obstinate cases the treatment may have to be extended for several days. Give the animal good wholesome food and plenty of pure cold water.

Paralysis.—This disease frequently follows distemper, but may result from a bad cold, worms, or from some injury to the spine. It will, however, usually yield to judicious treatment. The symptoms are a staggering gait in the hind quarters, which sometimes results in the dog losing all power over them, and will drag the body around by the fore parts. Clip off the hair over the loins and apply to the back, along the spine, a mustard paste until it creates considerable irritation of the skin. Make twenty pills of the following: One-half drachm of powdered nux vomica, one drachm gentian, one drachm iodide of potash. Give a quarter of a pill morning and night for three days; then increase to half a pill for three days more; then to three-quarters of a pill for three days, and finally to a whole pill. Continue this treatment until a rigidity of muscles and stiffness of the legs are noticed from half an hour to an hour after taking the pill. These symptoms prove that the medicine has had the desired effect, and when they appear the pill should be stopped. In large or old dogs, the dose is sometimes gradually increased to two pills, but it would be too large a dose for a small or young dog, and would kill any dog unless increased gradually as previously described. In giving a large dose great care should be taken not to omit a dose, for in such a case the following dose might kill the animal, since it is a powerful poison. Keep the animal clean, and the bowels open with an occasional dose of castor oil. Feed a light, nourishing diet, and while recovering, be careful not to let him exercise much, as over-exertion might bring on the disease again. Rub the hind quarters and legs several times a day, with the hands.

Poisons.—The first thing to be done when a dog has been poisoned is to give an emetic, which may consist of a teaspoonful of mustard in a tumbler full of luke-warm water. If this does not vomit the animal, in a moment or two repeat it. A few raw eggs or a little milk should be given after the emetic has taken effect, as they moderate the action of the poison that may still be retained on the stomach and bowels. Give shortly after a full dose

of castor oil to free the bowels. A dog of an average size requires about the same dose of every kind of medicine as an adult man.

Ring Worm.—This is a local irritation, usually characterized by an elevation of the skin in the form of a ring, which spreads, the ring still retaining its form. The skin of the affected part becomes scaly and rough, the hair finally dropping off. The disease is caused by a parasite, and produces intense itching of the parts affected. Wash well with soap and water, and apply a lotion, consisting of ten grains nitrate of silver and one ounce of water. Mix thoroughly, and apply twice a day with a camel's hair brush.

Surfeit.—Dogs that are highly fed and kept in too close confinement, are apt to suffer from a surplus of flesh, fits, vertigo, dropsical tendencies, etc. The best treatment is to avoid the cause, by gradually reducing the feed, and increasing the exercise. If the bowels are constipated give mild doses of castor oil, with injections of warm water, until the difficulty is removed.

Tetanus or Lockjaw.—This is very unusual in dogs, and when it occurs is very apt to prove fatal. Remedies are of little avail.

Worms.—These are a fruitful source of disease in the dog, and infest those of all ages, from the puppy to the old dog. There are numerous varieties, all of which are propagated by ova; some are, however, viviparous, and the medicine that may clear the system of them at one period may not result in a permanent cure, since the eggs that remain in the stomach and bowels may afterwards hatch. Besides the intestinal worms of different varieties, there are others, such as the large kidney worm, the hydatid, and the *Toenia coenurus*, sometimes found in the brains of herbivorous animals.

The Tape Worm is a flat-bodied worm made up of segments or joints from one-eighth to half an inch in length. These segments are joined end to end, forming a worm that may be from one inch to a hundred or more feet in length. Its head is furnished with circular sucking discs, surrounded by one or more rows of hooklets by which it attaches itself to the internal coat of the stomach and bowels. As fast as these segments of the worm mature, they detach one by one from the tail end of the worm, and are expelled from the body in the excrement. They then crawl about on the ground and grass laying their eggs, and are liable to be eaten by other animals, as has been previously described in connection with Swine. There are at least five different kinds of the Tape Worm in the dog, all differing more or less from each other, yet similar in many respects.

Round Worm.—The Round Worm (*Ascaris marginata*) is quite common with dogs, and often does serious injury when existing in large numbers. They are generally from two to seven inches in length, round, firm, and pinkish in color. The two extremities are precisely alike, and are slightly flattened in one direction at the point. They frequently collect in bunches in the bowels as large as a good sized egg; sometimes also crawling into the stomach. They are propagated by ova, but are sometimes hatched in the body of the parent, and a large worm will accordingly be occasionally seen full of small ones. The Round worm of the cat (*Ascaris mystax*) is quite similar, and is common to the human species.

The Maw Worm.—This worm is larger in the dog than in the human species, where it is a mere thread, and is called the "thread worm." In the dog it attains an inch in length, being of a milky white color.

Kidney Worm.—This worm (*Estrougylus gigar*) is found in the kidney of the horse, ox, hog, dog, wolf, otter, raccoon, and other animals. Owing to the nature of its food, which is derived from the vessels of the kidney, it is of a dark blood color.

Professor Owens, an English authority, says: "When suppuration has taken place round

it, the worm has been found of a whitish hue. In the human kidney it has been known to attain the length of three feet, with a diameter of half an inch. The head is obtuse, the mouth orbicular and surrounded by six hemispherical papillæ; the body is slightly impressed with a circular striæ, and with two longitudinal impressions." *Worms of the Heart.*—The *Filaria imitis* is a very small worm occasionally found in the heart, and are apt to cause sudden death.

Symptoms and Treatment.—The general symptoms of worms are an unhealthy appearance of the coat, which will look dead, and staring; a ravenous appetite; loss of flesh; dry cough, with a desire to vomit; irregular action of the bowels, sometimes being attended with diarrhœa, and sometimes constipation; nose hot and dry, and breath offensive. If the animal is much reduced fits are apt to follow, frequently causing death. The Kidney Worm causes bloody urine, more or less mixed with pus. The Maw Worm is less injurious than any other kind. When Tape Worms are suspected, let the dog go without food (giving plenty of water), for twenty-four hours; then give him a drachm of areca nut powdered and made into a pill with syrup; four or five hours afterwards, give a full dose of castor oil. When the latter has operated, give twenty drops of the oil of the male shield fern mixed with one tablespoonful of olive oil. These doses are for large mature dogs; for young or small dogs give proportionately less. Examine the excretion to see what kind of worms are passed, or if the head of the Tape Worm is removed, and treat accordingly. If the head of the Tape Worm is not removed repeat the treatment in two weeks. For Round Worms, give on an empty stomach every morning for a week from twenty to thirty drops of turpentine in a tablespoonful of castor or olive oil. Another remedy is the following powder, given every morning for a week before eating: 3 grains santonine; $1\frac{1}{2}$ grains sulphuret of iron; 15 grains of sugar of milk. This constitutes a single dose for a large, mature dog. After the last dose give two tablespoonfuls of castor oil mixed with fifteen drops of turpentine. At the end of three weeks repeat the treatment.

For worms in the kidney and heart, a leading English authority says: "Spirits of turpentine is without doubt the most efficacious of all worm medicines; but, if not given with care, is apt to upset the health of the dog, by irritating the mucous membrane of the alimentary canal, and of the kidneys also. I am satisfied, however, that it is not necessary to give it in its undiluted form, and that by mixing it with oil, its dangerous qualities are altogether suppressed. I have known young puppies, under two months of age, cleared of worms without the slightest injury, by giving them from three to ten drops, according to their size, in a teaspoonful of oil."

Wounds.—When a dog has been badly bitten, sew up the wound carefully, and bathe several times a day with a solution of equal parts of pure cider brandy, and water. This reduces the soreness and keeps out inflammation. When the feet of dogs get sore from punctures by thorns, exposure to cold water, etc., examine the feet carefully and remove the foreign body, if there be any, then bathe for some time in warm water, and apply a poultice of flax seed, or bread and milk, until the inflammation is gone; afterward bathe twice a day with the following lotion: one ounce of sugar of lead, mixed with one pint of water. Bandage loosely to prevent the dog licking off the lotion.

PREVENTION OF CRUELTY TO ANIMALS.

IT requires no argument to prove, that without domestic animals, agriculture would be utterly impossible. It is, therefore, simply in a practical view of the subject, the duty of every one interested in agriculture to employ the best possible means in their power for the improvement and welfare of farm stock, in order that the best conditions and possibilities for the purposes required may be attained. And this improvement and increased value cannot be secured without combining with the skillful breeder's art, intelligent and humane care. Mr. Bergh well says: "Every living creature has assigned to it a limit of endurance and power; and whoever attempts to exceed it, commits a blunder and a sin which is certain to avenge itself at a cost vastly disproportionate to the advantage contemplated.

That agriculture may reap full benefit of the labor of brutes, it is essential to estimate carefully the distance to be traveled, the weight to be carried, and the number of hours in the day, and the days in the week, to which their strength may be profitably applied. There is a universal law affecting the material interests of living and inanimate things, and that is—economy. Transgress this law in any of its relations to this world's affairs, and it speedily avenges itself by wasted physical power, deterioration of the elements of production, sterility, and death. It is a stupid delusion to suppose that any of the laws of the Creator of all things can be subverted or disobeyed by mankind with impunity. You may overwork, overdrive, overload, your patient and submissive animal; but you abstract so much wealth from your possession by so doing.

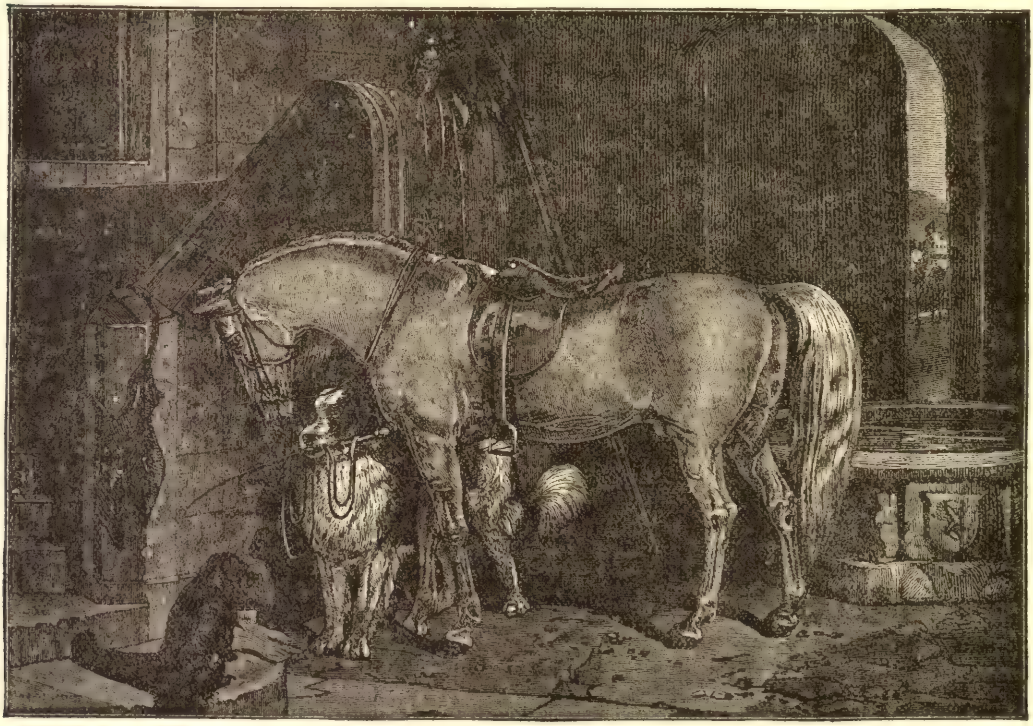
So interwoven and dependent on the brute creation is the prosperity, and even life, of mankind, that often the meanest insect and bird stand sentinel over their property. It would astonish and confound an individual addicted to the wanton destruction of little birds, for example, to learn the value to agriculture of these seemingly insignificant creatures. Permit me to cite an example of the unappreciable utility of only one of them, — the martin, a species of sparrow. From the 15th of April to the 29th of August, eighteen of these birds were once killed, in the stomachs of which were discovered not less than eighty-six hundred and ninety insects destructive to the produce of the farm; which gives, for each day and bird, a total of four hundred and eighty-three insects destroyed. Even though the senseless butchery of these feathered friends of man was done under the pretence of supplying food for the table, imagine, if it were possible, how many bushels of wheat, or barrels of wine, or bales of cotton are represented in each of these little victims."

Aside from the economy and profit to be derived from the humane treatment of the lower animals, no person of correct principle, refinement of feeling, and true sense of justice, would needlessly inflict suffering upon the lower animals, or lend his influence in permitting it. Man is "lord of creation," it is true, to a certain extent, and occupying this high position, it is his duty, as well as privilege, to protect and care for, the creatures that are his willing and faithful servants and subjects. It is surprising how indifferent to cruelty to animals many persons are who profess to be just in all their dealings with their fellow-man, and how many there are who consider themselves good Christians, and are quite conspicuous in their religious zeal among men, who are absolutely cruel and brutal in their treatment of dumb animals. The well-known words of the poet have aptly described the true relation between man and the lower animals:

"A man of kindness to his beast is kind;
But brutal actions show a brutal mind.
Remember, He that made thee, made the brute,
That gave thee speech and reason, formed him mute:

He can't complain; but God's all-seeing eye
Beholds thy cruelty, he hears his cry.
He was designed thy servant, not thy drudge,
And know that his Creator is thy Judge."

How a man can respect himself, or much less consider himself a Christian, who abuses the creatures God has placed under his care, is a wonder to those endowed with a sense of justice and humanity. It is argued by some that there is too much said about the sufferings of dumb animals, that they were made to endure and suffer, and that those interested in the subject of prevention of cruelty to them, greatly exaggerated the evils in this respect, etc. It requires but little observation and reflection however to perceive that animals are frequently greatly abused, and that the half has not been told that might be said in this respect. Animals are not mere machines, without sensation, but are acutely susceptible to suffering, the same as human kind.



WAITING FOR MASTER.

Dr. Chalmers says on this subject: "These sufferings are really felt. The beasts of the field are not so many automata without sensation, and just so constructed as to give forth all the natural signs and expressions of it. Nature hath not practiced this universal deception upon our species. These poor animals just look, and tremble, and give forth the very indications of suffering that we do. Theirs is the distinct cry of pain. Theirs is the unequivocal physiognomy of pain. They put on the same aspect of terror on the demonstrations of a menaced blow. They exhibit the same distortions of agony after the infliction of it. The bruise, or the burn, or the fracture, or the deep incision, or the fierce encounter with one of equal or superior strength affects them similarly to ourselves. Their blood circulates as ours. They have pulsations in various parts of the body like ours. They sicken, and they grow feeble with age, and, finally, they die — just as we do. They possess the same feelings;

and what exposes them to like sufferings from another quarter, they possess the same instincts with our own species. The lioness robbed of her whelps causes the wilderness to ring aloud with the proclamation of her wrongs; or the bird, whose little household has been stolen, fills and saddens all the grove with melodies of deepest pathos."

Aside from a practical and humane standpoint, there is still another consideration of vital importance involved in the subject of kindness to animals, and that is, its reflex influence upon the character of individuals and society at large; for not only are animals kindly treated more valuable and useful every way, but the inauguration of a system of humane treatment of the brute creation has a wonderfully refining and elevating influence upon mankind. For this reason, children should early be taught to be kind and considerate to all dumb animals, for this will aid vastly in establishing correct principles of justice and honor that a child who is permitted to witness and practice cruelty to inferior orders of creation can never possess. The "Bands of Mercy," that are being formed all over the country, enlisting children in their ranks, are exerting an influence in the right direction that can never be computed.

The efforts made by Mr. Angell, President of the Massachusetts Society for the Prevention of Cruelty to Animals, in endeavoring to make it an established law that it be the duty of all teachers in the public schools to teach their scholars to protect insect-eating birds and their nests, and treat all domestic animals kindly, is an example worthy of imitation, and if such a law could be adopted in every State in the Union, the educating and refining influence that would be the result, would indeed be surprising! Besides the enforcement of such a law, societies for the prevention of cruelty to animals should be established in every city and town, not only as a refining and elevating element among the people, but better still, as an active organization for the prevention of cruelty.

History states that the tyrant Domitian, while a mere infant, foreshadowed the evil character that afterwards terrified and horrified the world, in his love of cruelty to flies and other insects by tearing off their wings and legs. It is said that Louis XIII of France when a child once crushed beneath his foot a little tame sparrow that took refuge in his bosom, and that the good king his father, Henry IV, seeing the cruel act, exclaimed to the queen, "Wife, I pray that I may outlive that son, else he will be sure to maltreat his mother." It is well known that the prediction was verified, and that Marie de Medicis died at Cologne at the age of eighty-six, exiled and reduced to the extreme of misery by this son. At the siege of Montauban, he who was the cruel child, now a mature man and a monarch, stood fiendishly by and mimicked the dying contortions of his Protestant prisoners. Surely the child is typical of the man, and if humane influences can modify and form the plastic mind and character of the child, much good can be accomplished to the world. On the other hand, brutal and unkind treatment witnessed or produced by the child or older persons has a hardening, brutalizing influence, the education being in an opposite direction. Pigeon shooting, as practiced in many localities, is extremely cruel and brutal.

A recent writer in commenting upon a pigeon-shooting match, in which several caged pigeons were let loose one at a time to be shot at, says: "There is something in the pleasures and perils of the chase which appeals to that spirit of adventure which has its home in the breast of the boy, and which the mature and sober citizen rarely succeeds in subjugating and suppressing. The pursuit of the nobler varieties of game is a school of courage and endurance, and steadiness of nerve. The heroic element does not manifest itself to any inspiring degree in the slaughter of the more timid birds and animals; but, after all, the shooting of so-called game birds is only following the strong and irrepressible instinct inherited from a barbarian, and, perhaps, a quadrumanous ancestry. Of course it is an unequal contest; but when the game is pursued on its own ground, where it enjoys every opportunity for concealment or escape, and when the generous sportsman so far recognizes the rights of the

pursued that he scorns to take unfair advantages with trap or snare, it comes to a contest between wariness and skill. The pure murderous features of gunning are in this way toned down and wiped out, and the sport loses the taint of brutality. It is difficult, however, to understand how trap-shooting can be considered a manly or ennobling pastime. When birds, which are the very emblems of innocence, are captured alive and then set free in front of the so-called sportsman's gun to be slaughtered, the sport becomes butchery, and pretty coarse butchery at that."

Aside from domestic animals being more valuable and easily managed that are treated kindly, it is wonderful to what an extent their intelligence and sagacity may be utilized and

THE SOCIETY OF FRIENDS.

increased when their education or training is conducted on the principles of kindness. Professor Bartholomew, whose trained horses have excited the wonder and admiration of thousands in this country by their almost incredible exploits, states that the training of them was all done simply by kindness, never by punishment. These horses are sixteen in number, and Professor Bartholomew talks to them as to children, they seeming to understand all that he says. When they do well, he praises them; when they come short of their duties, he censures them, and they evidently distinguish the one from the other. He claims that they know and comprehend the meaning of three hundred distinct words as intelligently as human beings.

The performances of these educated horses are described as follows: They are not

guided by bit or bridle, nor by a significant bearing down of a rider's saddle. The owner and teacher stands remote from them, and by word of mouth calls upon them individually and collectively to go and do certain acts that he has taught them. When the school of animals enters the arena, he singles out different ones by their distinguishing name and bids such go and salute the audience. In response to such command the horse specified leaves his companions, and, coming forward to the "foot-lights," bows to the assemblage. He asks one of the school to "go and open a desk and bring him a handkerchief." Another he commands to take a sponge and rub out some figures on a black board. Another he commands "to march," "to trot," "to run," and by such a simple command the gait changes simultaneously with the request. Another he orders to describe a figure "8" by the movement of his body, and calls upon the audience to say whether he shall describe it by commencing at the right or the left, and as the voice from the audience determines so is it.

He orders four of his horses to go and stand side by side for a game of "leap-frog," and then calls upon one of the audience to nominate some other horse that shall run and leap over all four of them. So soon as one of the horses hears his own name called by some person in the audience, just as soon does the animal named catch the spirit of the "turf," and with an exciting impetuosity he wildly and gladly runs, and with a leap and a bound he clears all four animals amidst the plaudits of the multitude. It is amusing to see the cocked ears of all the horses as they wait the mention of their names. The teacher of this school of animals took a large Geneva music-box, and as soon as it was wound up, these horses grouped themselves around him and endeavored to get their heads into his lap. and when self-posed they listened with wrapt attention.

An immense "see-saw" was arranged in the arena, and at the word of command the horse nominated went up the plank, and when in the middle of it, he stood for five minutes "see-sawing" that plank to the wonder and amusement of every beholder. While thus standing and balancing that huge plank the owner called the name of another horse, and at once the last named got upon the same plank, and the two horses at the extreme ends of that plank stood and "see-sawed" as perfectly and as nonchalantly as two men could. The next scene was very exciting. The owner arrayed himself in a military uniform, and at a bugle-call twelve horses entered, wearing a crimson ribbon around their barrels, and entered with a soldierly step. They at once arranged themselves into a military line and "dressed" right or left pursuant to command. The evolutions, and marchings, and counter-marchings of these quadruped-soldiers, in obedience to oral requirement, were indescribably wonderful and fascinating. They marched with perfect precision in a body. They marched in platoons. They marched in ever-varying sections. They filed "right" and they filed "left," they formed a hollow square, and went through the tactics of a military drill with an exactitude that baffles description.

But the final scene was the climax of all. It was a "horse court." One of the horses was indicted for "murder." The bell rang. The curtain rose and "the court-room" was before you. Six horses were in the "jury-box." The horse charged with murder was in the prisoner's dock, and was fastened with chains. The judge's bench was a lofty structure, and looked like an old-fashioned New England pulpit. In it sat a sober-visaged donkey, with flamboyant ears, looking every inch a judge. The owner charged the jurors and ordered them to retire. At once these educated horses withdrew, but soon afterwards came back into court, and once again entered "the jury-box." The teacher, in behalf of the long-eared judge, now called for a verdict, and immediately thereafter one of the number (the foreman) held up in his teeth a placard, on which was printed "Not Guilty." This placard was handed from "jury-horse" to "jury-horse," and each one received it in his teeth and held it up for public inspection. The owner then commanded that the prisoner be released, and at that word another horse, acting as "Sheriff," went up, and with his teeth unfastened the chains, and the prisoner

came forth and intelligently saluted the audience. These horses go through a mimic battle, capturing a fort, firing the cannon with their teeth, lying down to avoid the enemy's fire, and at last capturing and passing the hostile flag from one to another.

CHAIN HANGING CATTLE STANCHION.

Too much indifference respecting the comfort and welfare of animals that are transported in freight cars is manifested by those having the care of them, they being frequently crowded together so closely as to prevent their lying down, or if they chance to get down, to prevent their getting up; so that it is no uncommon sight to find those that have been trampled to death by their fellows in freight cars, while the poor creatures are kept standing for days together, with but a scanty supply of food or water. Beef or other meat obtained from such sources cannot be regarded as fit for human food. The present custom that seems destined to obviate this difficulty, is that of transporting the beef in refrigerator cars from the great Western markets, instead of sending the animals East and to other sections to be butchered. Cattle are frequently tied in stables in such a manner as to scarcely be able to lie down with any degree of comfort, or to move in an easy manner in any direction. Farmers are generally too indifferent and careless in this respect. Stanchions of some kind that will admit of a free and easy motion of the animals when in the stable are a great improvement on the old method of fastening. The above device, the invention of a Connecticut farmer, seems admirably adapted to obviate all objections of the old time method of fastening.

How to Kill Animals Humanely. — Since it is necessary, whether for food or other reasons, to kill animals, it should be done in the most humane manner possible. For the purpose of imparting instructions as to the best methods of doing this, we give the following directions, recommended by Dr. D. D. Slade, Professor of Zoölogy, Harvard College, and one of the directors of the Massachusetts Society for the Prevention of Cruelty to Animals. These directions are intended to give instruction to those who desire to terminate the existence of animals in the most speedy and humane manner, whether such animals are intended for food, or whether they have become useless through age, sickness, or other cause. When we reflect upon the vast number of animals which are put to death in our own country alone, for food, estimated at more than fifty millions every year, not to speak of the thousands that are destroyed for other reasons; and when we bear in mind that a great proportion of these animals are put to death, often with the most needless cruelty, simply through ignorance of the proper method of producing speedy death — it will be readily admitted that an attempt to enlighten the public in this respect may at least serve to diminish the amount of such cruelty, and indirectly lead to other equally satisfactory results. While we write more especially for the farmer, who is from circumstances obliged to slaughter his own animals, and for those who are called upon reluctantly to rid themselves of some fond but disabled pet, we also desire to call the attention of those who pursue the slaughtering of animals as a business to the great necessity of doing their work in the most humane manner possible. To this end, there are certain measures of importance to be kept in view, and to be carried into practice.

Precautions. — The animal to be slaughtered should be conducted to the spot selected as quietly as possible, without the use of goad or club, and everything calculated to alarm him

should be removed. All slaughtering premises should be kept thoroughly cleansed from blood and offal, and no carcasses be allowed to hang in view. No animal should be permitted to witness the death of another. Trifling as these measures may appear to the professional butcher, they are in reality of vast importance, not only in view of avoiding useless cruelty, but as affecting the wholesomeness of meat for food, and the market value of the animal slaughtered; there being no question as to the effects of torture, cruelty, and fear upon the secretions, and, if upon the secretions, necessarily upon the flesh.

Methods. — The slaughtering of animals for food at the present day may be classified under three methods: 1. Rendering the animal insensible by a blow on the head, followed by bleeding. 2. Cutting through or injuring the spinal cord (pithing), so as to destroy the powers of motion and sensation, with subsequent bleeding. 3. Cutting the throat, deeply dividing all the blood vessels, with or without thrusting the knife into the heart, and without previously stunning the animal. This last method is practiced by the Jews.

From certain experiments conducted for the purpose a few years since in the abattoirs of Paris, it would seem that the first of these methods, namely, that of producing insensibility by some sudden shock to the brain, such as that of a direct and concentrated blow, especially if followed by immediate blood-letting, is attended by less suffering than when death is effected by decapitation, pithing, or cutting the throat without previously producing such insensibility.

A German observer (Dr. Sondermann, of Munich) remarks upon this subject: "All methods of slaughtering have for their object the death of the animal in a more or less speedy, but always in the least painful manner possible. But what is death? and when does actual death occur? Simple as these two questions may appear, they are nevertheless very difficult to answer. A mammal whose head has been cut off by a guillotine does not die immediately. Actual death occurs some seconds or minutes afterwards. All methods of slaughtering, other than the one in which insensibility is produced by a severe shock to the brain, followed by bleeding, produce, without exception, only apparent death, after which follows the actual death, the latter being always accompanied with an entire cessation of nervous and muscular excitability."

Voluntary and Involuntary Motion. — There are two kinds of motion. The one is voluntary, and dependent upon the brain. So long as this organ remains unimpaired, so long will consciousness, sensation, and the power of voluntary motion continue. The other is involuntary, and dependent upon the action of the spinal cord as a nervous centre, and is known as reflex action. This kind of motion is exhibited in the movements of animals after decapitation, where all connection with the brain, and conseauently with consciousness, has been cut off.

So intimately connected in our minds are pain and action, that in witnessing the slaughter of two animals we are naturally inclined to attribute the greatest amount of suffering to the one that at the time of death exhibits the most violent convulsions. In such a conjecture, however, we may be very much mistaken, for it is possible, nay, even probable, that there may be acute suffering with scarcely a struggle on the part of the animal; while, on the other hand, there may be much struggling, and even distortions, without pain or sensations of any kind, as is often made evident in cases of decapitation where. as we have just remarked, all connection with the brain has been removed.

Thus we see that the movements of an animal in the act of being killed are not at all to be relied upon as evidences of pain.

Pithing. — The term "pithing" is applied to two methods of inflicting injury to the nervous system, and thereby producing death. By one method, that most commonly in vogue, the spinal cord is severed or punctured between the first and second bones of the neck,

where the peculiarity of the articulation leaves an opening. This is done by a variety of instruments. Although the animal drops immediately, life continues for some seconds, and even minutes, the heart continues to beat, and the brain to live and act. By the other method, a small spot situated in the lower and posterior portion of the brain is reached and broken up by the introduction of a narrow, sharp instrument. Death is almost instantaneous. "No attempt is made at inspiration, there is no struggle, and no appearance of suffering. The animal dies simply by a want of aeration of the blood, which leads in a few moments to an arrest of the circulation.—(Dalton's Physiology.) Both of these modes of slaughtering, especially the last, require an anatomical knowledge as well as a practical dexterity that but few would attain, and, if they are not properly and quickly executed, are undoubtedly attended by more suffering than by other methods.

Depriving of Sensibility. — Without entering further into the consideration of physiological questions of so much importance, we may with safety lay down the following proposition, viz.: All animals, when slaughtered, should be deprived of sensibility by inflicting sufficient injury to the brain, either by a sudden and violent blow of the axe or mallet, by the bullet, or by some other equally efficient means, and should then be immediately bled during the state of insensibility.

SITUATION OF THE BRAIN. (FIG. 1.)

It is important to know the exact situation of the brain in animals, so that the shock to this organ may be conveyed effectually and at once, and not by clumsy and ill-directed efforts, as is too often the case. It should be kept in mind that the brain of animals occupies but a comparatively small portion of the entire head. In the attempt to fell them, the tendency is almost always to strike too low. Fig. 1 represents a longitudinal section of the horse's head, showing the situation of the brain, and also the thinness of the frontal bone as compared with the corresponding region in the ox. The horse may be destroyed by blows upon the head, by the bullet, or by chloroform.

1. *By Blows.* — Having blindfolded the horse, the operator, armed with a heavy axe or hammer, should stand upon the side and to the front of the animal, directing his blow to a point in the middle of a line drawn across the forehead from the center of the pit above the eye. (See Fig. 2.) One vigorous and well-directed blow will fell the animal, but the blow should be repeated to make destruction sure.

2. *By the Bullet.* — The operator should stand directly in front of the animal, and place the muzzle of the rifle or pistol within a few inches of the skull, aiming at the spot indicated in Fig. 2. One shot is generally sufficient, if properly directed in either case; if not, it should be repeated after the animal falls. In most instances, so great and instantaneous is the shock to the brain from a bullet that death follows instantly. A shotgun loaded with buckshot is effectual, and may often be more conveniently procured.

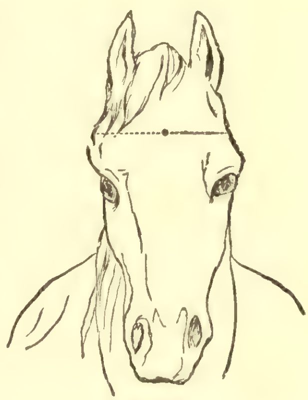


FIG. 2.

3. *By Chloroform.* — Procure a common feed-bag or small sack made of thin cotton cloth, or of any sufficiently strong material, provided with strings or a strap to fasten over the head, and at the bottom of this place a large sponge or a yard of flannel folded to the size of eight inches square. The sponge or flannel is to be saturated with chloroform and the bag adjusted. If the suffocation and consequent struggling, which at first attend the admin-

istration of anæsthetics, are very great, the application of the chloroform may be gradual, the animal being allowed to respire the outward air for a moment, until these effects pass off. As it is by the exclusion of common air, however, that death is produced, the more persistently the administration of the chloroform is kept up, the more speedy will be the desired result. The dose requisite varies very much according to circumstances. At least sixteen ounces of chloroform should be procured, and it should be freshly applied through a small slit in the bag every few minutes until death ensues, which will be from five to ten or fifteen minutes after the beginning of the operation.

The difficulties attending the administration of chloroform to so large and powerful an animal as the horse, particularly at the hands of the inexperienced, render its use less applicable than either of the other methods. In cases where sickness and consequent debility have reduced the animal, and made him less capable of struggling, it answers a good purpose, or where a pet horse is to be killed, and the owner is unwilling that the deadly blow shall be struck, chloroform may be resorted to, but, as a general rule, we do not recommend its use where the normal amount of strength still remains.

Best Method of Killing Cattle.—The skull of the ox is thicker and heavier than that of the horse, and the brain still smaller in comparison with the entire head. The frontal bone is composed of two plates, which are separated by bony ridges, forming cells or sinuses. This arrangement (seen in Fig. 3, which represents a longitudinal section of the head), gives to the parts great strength, and forms a secure defence against injuries to the brain, which lies beneath.

FIG. 3.

Cattle are most readily and conveniently destroyed by blows on the head with a heavy axe or hammer, followed by immediate blood-letting. The animal which is to be killed should be secured by means of a rope passed round the horns and fastened to a post, or, if practicable, carried through a ring in the floor, and held or made fast by an assistant. The animal being blindfolded, the operator, armed with a heavy axe or hammer, stands at the side and a little in front of it, and aims his blow at a spot in the middle of a line drawn across the forehead about one inch and a half below the base of the horns, or, perhaps better, at a spot where two diagonal lines intersect, drawn from the eyes to the base of the horns. (Fig. 4.)

FIG. 4.

In most cases, if the blow is heavy and properly directed, the animal falls instantly; but it is better even then to repeat the blow, and to follow it by immediate bleeding. This is accomplished either by drawing back the head, and cutting deeply across the neck at the upper portion of the windpipe, severing all the blood-vessels, or by plunging a long and sharp-pointed knife into the heart and large blood-vessels at a point corresponding to the upper portion of the brisket, and just above the breast-bone.

Failure to fell the animal at the first blow cannot be attributed to any difference in the anatomical structure of the part, but rather to the fact that the blow was ill-directed, almost invariably too low, that it was not sufficiently powerful, or that both of these faults were combined.

Slaughtering Calves.—In the slaughtering of calves it is not a common practice with us, as it is with France and other countries, to render them insensible before bleeding, for fear that the brain may be made less inviting as an article of food by being torn and

stained with blood. By using a broad mallet this may be in great measure avoided, and even if these results do follow, they do not in reality alter the quality of the brain for edible purposes. Objections to the humane destruction of an animal on such grounds are as unreasonable as those which are made to juicy and wholesome red veal by people who prefer that which has been rendered white, dry, and innutritious by repeated bleedings, which have reduced the calf, before death, to a lingering condition of faintness and debility.

The calf should first be stunned by a blow upon the head by a broad mallet or hammer, aimed at a spot relatively the same as in the full-grown animal. This is to be followed by immediate bleeding, by severing the throat at a point corresponding to the upper portion of the windpipe, using a sharp knife and doing the work thoroughly and at once, so as to open all the arteries and veins of the neck.

Slaughter of Sheep and Lambs.—Sheep and lambs should be rendered insensible by a blow upon the head, to be followed subsequently by severing the throat, as just advised in the case of calves, or by plunging a sharp-pointed knife through the blood-vessels at either side of the neck between the bones and the windpipe. The place to be selected for a blow is the center of a line drawn across the head about two inches above the eyes, the brain in the sheep occupying a situation posterior to what at first sight would appear to be the natural one.

Best Method of Slaughtering Swine.—There is an idea prevalent among farmers, and even among many of those who practice the slaughtering of swine as an avocation, that, if these animals are first rendered insensible by blows upon the head, it is impossible to empty the blood-vessels.

There is no foundation, however, for any such opinion. Any obstacles to bleeding are due, not to material differences in the anatomical arrangement of the blood-vessels, but solely to the difficulties attending the cutting through of the great mass of fat and flesh which characterizes the necks of swine in order to reach these vessels. This very difficulty is a reason why the animal should be rendered insensible before bleeding, not only on the score of humanity, but also on the score of avoiding the barbarous sights and sounds which so frequently disgrace our towns and villages.

In Europe generally, the swine are always first rendered insensible by being stunned. They should be made insensible by a blow upon the head, directed, not between the eyes, but upon a spot in the middle of a line drawn across the head three or four inches above the eyes. A long, sharp knife should then be thrust deeply through the lower portion of the brisket, at a point just above the breast-bone, severing the large vessels leading from the heart. The point of the knife, after it has been thrust in, should be swept about and made to cut more extensively in the deep parts than at the surface. This insures the thorough division of the blood-vessels, and the most rapid and effectual bleeding of the animal.

Killing Dogs, Cats, etc.—Small dogs, cats, and other diminutive animals, particularly if sick or in any way disabled, are humanely destroyed by means of chloroform. This substance should be administered by pouring from two to four tablespoonfuls of it on to a sponge or folded flannel, placed within a thick cloth or towel, and applied over the mouth and nostrils. If the struggling is severe at first, the administration of the chloroform may be made more gradual by removing the sponge or flannel for a moment altogether, and then reapplying it; and, as the animal becomes quiet, it should be kept on closely and constantly, to the entire exclusion of the outward air, adding fresh chloroform from time to time until death occurs. The length of the operation will depend upon the size and condition of the animal, and the persistence with which the administration has been kept up.

As a protection against the struggles of the animal to free itself, the body may be placed in a sack or bag, allowing the head to protrude. Or a blanket may be thrown over the body, by which it may be grasped, while the head is left free for the application of the sponge. Or the animal, together with the saturated sponge, may be placed in a small box and allowed to go quietly to rest.

The young of cats and dogs, when but a few days or hours old, may be humanely destroyed by drowning, if properly executed. This can be best accomplished by placing them in a tight bag containing a stone of sufficient weight to insure speedy sinking. The quickest method of terminating the existence of a large dog is, undoubtedly, to shoot him. Place the muzzle of a pistol or rifle within a few inches of the head, at the side, just over and in front of the ear. If directed behind the ear, the ball is likely to glance and pass through the soft parts of the neck, and death would neither be so certain nor so instantaneous as if the brain had been pierced.

In the attempt to destroy it, no animal should be merely maimed. For this reason, if a gun or a fowling-piece should be used, it should be charged with buck-shot, the side of the head aimed at, and sufficiently near to insure speedy death. The same remarks apply to the destruction of cats. As this animal is smaller, however, death may be instantly effected by small shot fired from a gun at the head, sufficiently near to prevent the scattering of the charge.

Killing Poultry.—The remarks which we have already made as regards producing insensibility by a blow upon the brain may equally apply to poultry. The almost universal method of killing by chopping off the head of a fowl, and allowing the body to flutter about upon the ground, is not an agreeable sight, and has certainly a demoralizing effect upon those who witness it, especially upon the young and those who are not yet callous to such sights. The same may be said also of the practice of opening the blood-vessels in the necks of poultry, and allowing them to bleed to death more or less slowly. Therefore, to produce insensibility, make use of either of the following modes:

1. Grasp the bird by the legs, place its head upon a block, and strike it a smart, quick blow with a small club, or with some equally efficient weapon, and then immediately sever the head from the body by a sharp cleaver or hatchet. Retain the body in the hand until all fluttering has ceased.

2. Take the bird up, compress the throat between the thumb and finger for a minute. Retaining the grasp, swing the body round several times, and then remove the head as just described. Hence insensibility is produced by suffocation and loss of motion by the twisting of the bones of the neck.

3. A very sharp blow, with a small but heavy stick, behind the neck, at about the second joint from the head, will injure the spinal cord so as to destroy sensation and motion, if properly executed; the head to be afterwards severed from the neck.

4. Hang up the bird by the legs, and thrust a long, narrow, sharp-pointed knife, like a pen-knife, into the brain through the back part of the roof of the mouth. Death is instantaneous. To do this considerable dexterity is required.

Killing Fish.—It has been observed that fish which are instantly killed on being taken from the water are vastly superior, in taste and solidity, to those which are allowed to die, as is the universal custom with us. And why should this not be the case? Why should we make a distinction in this respect between animals that swim and those that fly or run? No one of us would think of eating beast or bird that had died a natural death. Various modes of killing fish are practiced by different people. The Dutch, for example, destroy life by making a slight longitudinal incision under the tail by means of a very sharp instrument.

On the Rhine they kill the salmon by thrusting a steel needle into their heads. Fish may be easily destroyed by striking them a quick, sharp blow with a small stick on the back of the head just behind the eyes, or by taking them by the tail and striking the head quickly against any hard substance.

Poison and Gases.—We have made no remarks upon the destruction of animal life by means of deadly poisons, as such agents cannot, with safety, be placed in the hands of the unskilled. Neither have we spoken of the use of various gases as a means of humane destruction, such means not being at the disposal of the people generally.

PART IV.

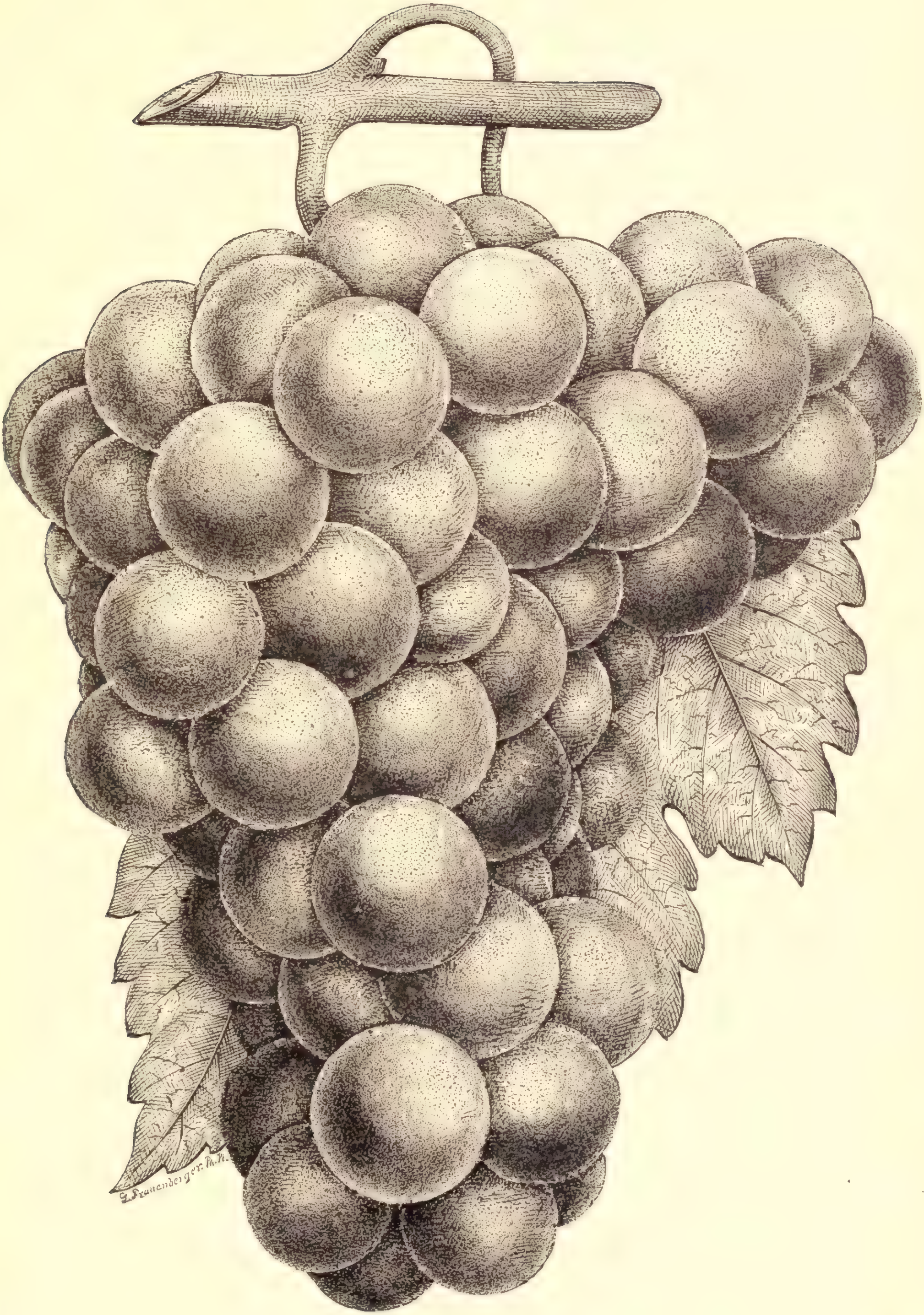
FRUIT CULTURE.

FRUIT ON THE FARM.

IT is the occasion of surprise to those who have given a thought to the subject, thatfarmers generally are not more interested in fruit-growing, that they do not take more pains to cultivate in abundance the best of the several varieties of fruit adapted to the climate and soil in which their farms may be located, thus not only providing the means of comfort, health, and nutriment for the family, but also increasing the attractiveness of the home, and furnishing a source of enjoyment to its inmates, as well as profit in farm production, for good fruit will always command a fair price in any market; and not only this, but there is no question but that a farm well stocked with fruit trees, grape vines, and the smaller fruits will find a more ready market when its sale is desired, and will command a higher price than one destitute of these provisions of comfort and luxury, for good fruit is not only a source of enjoyment, but a luxury as well, and one that ali should enjoy. It is a recognized fact, that a good orchard on a farm will do more towards bringing a high price in its sale than many other things that may be much more expensive. The planting of an orchard is a permanent improvement which, when once established, requires, when the benefits derived are considered, comparatively but little expense and labor. A farm without fruit lacks one of the most desirable products of the soil, and seems incomplete and barren of the most attractive feature of a well-conducted farm, however systematic and thorough its management may be in other respects.

The erroneous idea often prevails that fruit, as an article of food, is injurious, and if eaten at all should be taken sparingly; also, that it should not be used by dyspeptics. We believe this opinion wholly unsustained either by reason or experience, and that good ripe fruit, when taken liberally, will not only conduce to health, but longevity as well, and that many diseases, chronic and otherwise, may be entirely cured and avoided by its free use. We have known some of the most obstinate cases of dyspepsia cured by this means. We are glad to know that the old maxim, that "fruit is gold in the morning, silver at noon, and lead at night," though having at present many believers who may variously interpret it, has a smaller number of adherents than formerly, and the number is year by year constantly growing less; also, that the culture and common use of fruit as one of the articles of diet, is becoming more general. Our own experience in using freely all the cultivated fruits is, that they may be eaten with perfect impunity at any hour that any other article of food may be allowed, and when cooked properly may be used by invalids with great benefit; also, that a sick person is often more benefited by a good ripe peach, or a few choice strawberries and grapes than by any drug that the physician may prescribe or the apothecary supply.

Should people generally adopt a more liberal use of good fruit as an article of food, there is no doubt that the present average standard of health would be greatly improved, longevity increased, and many of the now common diseases yield more readily to the effects of the intelligent and skillful treatment of a reliable physician. Fruit should be found on every table as commonly as bread, meat, or any of the other articles of diet; in fact, although bread may truly be regarded as the staff of life,—which can truly be said only of *good* bread,



THE POCKLINGTON.

—(we have seen bread of a quality that might be regarded as the *weapon of death*;) yet we believe that the use of bread even could be dispensed with in a family with fewer injurious results than that of fruit. The apple and grape stand first among the fruits of the northern climate, both in their capacity for production, and their great value as food; being not only heathful, but nutritious; and if our farmers generally would look at this subject in its proper light, in a sanitary, æsthetic, and financial point of view, we believe a more active interest would be taken in it, and new and thrifty orchards would be seen where now there are none or only those of an inferior quality, and many a country home be supplied with an abundance of choice fruit that has formerly had but a limited quantity, and perhaps that only of the most indifferent quality. We would say to farmers generally, cultivate more fruit, and not only this, but fruit of the best kind. It costs no more to grow choice than inferior fruits. Trees and vines of a poor variety extract as much fertility from the soil and require as much care, as those of the very best quality; therefore, in an economical point of view, it is better to plant the very best varieties, although they may perhaps be most expensive at first in purchasing.

Of course, the lack of interest in fruit culture can be imputed to only a portion of the farmers of the country, but we regret to know that this is by far the *largest* portion, and those who appreciate this department of agriculture, and appropriate a fair portion of their lands to its use, compared with other products, are greatly in the minority. While a farm without fruit is deficient in one of the choicest products, its culture may be carried to the other extreme on some farms, and cease to be a means of profit. No farmer with a just view of his business would think of devoting a half or two-thirds of a farm designed for a variety of products, to orchards. The same may be true of any single product of the soil, but the "golden mean" or what might be termed the "happy medium," between the two extremes, —that of no fruit at all, and an unprofitable supply or surplus,—will be found not only a source of health and comfort, but profit. There is also much enjoyment as well as profit attending the duties of fruit culture, an undefined something which results in ennobling and refining the nature of man, creating a taste for the beautiful, as well as the good, for:—

"The good is always beautiful
The beautiful is good."

Hon. Marshall P. Wilder, who has done so much for the advancement of fruit culture in this country, both as a private citizen and as a public official of the American Pomological Society for over thirty years, says in this connection:—

"I know of no better temporal acquisition than a happy rural home,—a home where you may sit amid the fruiting of your trees and the blossoming of your plants,—a home embellished by your own taste, and endeared by pleasures shared in common with the loved ones of your family—a happy country home, with trees and fruits and flowers, where you may find enjoyment, not in hungry greed for gold, not in the conflicts for political distinction, not in the strife for place, power, or renown. For more than fifty years I have trod the crowded marts of trade and commerce. I have shared in the privileges and perplexities of public service, and I have enjoyed the soul-reviving sympathy of family and friends, but I have never forgotten my first love for rural life. Oh, no; whenever I could rescue a little time from the cares of business,—whether at rosy morn, golden noon, or declining day, I have fled to the garden and greenhouse, to my favorite trees and plants, that I might commune and co-operate with nature in her secret laboratory of wonder-working power. This is my idea of a happy, rural home; and this my idea of a happy man,—he who is contented with fruits and flowers reared by his own care, with congenial friends, and a good conscience towards God and his fellow-men. And it has ever appeared to me that contentment and happiness were easily to be acquired by all who really love the cultivation of these lovely objects."

Among the early things that require attention from the farmer in establishing a home,

where there is not already a sufficient supply, is the liberal planting of many varieties of the best fruits, of all kinds, both large and small. And we would advise no farmer in making this important improvement on his new farm, to allow an entire year to go by without its being accomplished if possible, since the sooner they are started in growth, the sooner will he reap the result of his labors, and gather the fruit his own hands have carefully planted, pruned, and tended, and which, it has always seemed to us, tasted a little sweeter than that from other sources, since it has blended with its pleasant aroma and delicious flavor, these most attractive associations. It is astonishing to note the progress made in fruit culture within the last half century, and every year affords additional evidence of the skill of man in the acquisitions of new and valuable varieties, the ease with which they may be obtained, and the degree of perfection that may be reached by careful culture.

Hon. Marshall P. Wilder says in this connection: "Fifty years ago the products of our soil were scarcely thought worthy of a place in the statistics of our country. Now our exports of these amount to nearly six hundred millions of dollars annually, and our western granaries are treasure houses upon which the world may draw to supply deficiencies elsewhere. Then the supply of fruits in our market, excepting apples, was limited to a few varieties and to a few weeks of use. Now our markets abound with fruits for all seasons of the year. Then almost the only strawberry in our market was the wild strawberry of the field, and that limited to a short season. Now we have in variety these delicious fruits, by the facilities of transportation, for two or three months, receiving from the South in a single day five thousand bushels, and from the single city of Norfolk, in Virginia, sixteen thousand bushels, and from our own town of Dighton ten thousand bushels in a year. Then not a single hybridized fruit of the strawberry had been produced, so far as we know, in our land; now so great has been the increase in this period that my register contains the names of nearly four hundred kinds of strawberries that have been under cultivation in my day. Then there were no American grapes cultivated in our gardens except here and there a vine of the Catawba or Isabella; now there are more than two hundred varieties of American grapes in cultivation, and grapes may be had from our shops during more than half the year; and so extensive are our vineyards that, in addition to the production of the grape for the table, California alone produces ten millions of gallons of wine, of which large quantities have been exported to Europe, South America, and Mexico, some of which is mulled over and returned for consumption.

Then the cultivation of the pear was limited to a few varieties, since which the gardens of Manning, Hovey, the writer, and others have embraced more than eight hundred varieties of this noble fruit. Then no exports of fruit of any note had been made. Now, Boston alone has shipped over six hundred thousand barrels of apples in a year, and the export of fruit from this country has amounted to nearly three millions of dollars in a year."

Production of New and Improved Varieties of Fruit from Seed.—The only means of securing valuable fruits adapted to the various sections of our country, is in the production of new varieties, which are obtained principally by hybridization, or the cross impregnation of plants. Colonel Wilder says respecting this subject: "The scientific laws upon which this science is founded are as fixed and certain as those of moral and natural philosophy, the same yesterday, to-day, and forever, and although we may not now be able to prescribe the exact limits to which improvement may be extended, we do know that upon the subtle forces of hybridization, either accidental or by the hand of man, we must ever depend for the improvement of our fruits. Natural hybridization, or the cross-impregnation of plants, is as old as creation, and must have given to man the first idea of the power placed in his hand for the improvement of the species. God works by means, in nature and in grace, and requires us to join our efforts with His. 'Seek and ye shall find; knock and it shall be opened to you,' were the original conditions. Nor do we doubt that this art was confided to

man by the Creator, that it might be developed to its utmost extent in the improvement of both animal and vegetable life.

Thus, we are to work, in accordance with His command and that divine wisdom which is ever tending towards a higher state of perfection — nature is the handmaid, man the agent to coöperate with her — and the highest triumph of his skill is to control and elevate her for the benefit of our race. 'It is the part of man to create,' says Ralph Waldo Emerson, 'and his profession as a cultivator of the soil, too, stands nearest to God, the first cause.' The first seeds sown by man were the germs from which sprang the civilization, elevation, and refinement of the human race. So it is with the amelioration and improvement of our fruits. From the sour crab, the puckery pear, the bitter almond, and the austere plum, came the the tender, spicy apple, the melting, juicy pear, the velvet, luscious peach, the delicious purple or golden plum, and from our rank, foxy grape, came the splendid varieties which now adorn our tables and 'make glad the heart of man.'

The laws of reproduction we do not now fully understand, but from the improvement which we have already witnessed we have reason to believe that we have only to become familiar with their operations and our efforts will be crowned with success. There may be a limit beyond which a fruit may not be improved; but the marvel is, that, considering the inferior character of the fruits of former days, we have been able to produce so many of the fine varieties which now grace our exhibitions. And when we take into consideration the number of fine varieties of American origin which have been produced during the existence of pomological societies in our country, we have cause for the greatest encouragement and perseverance.

But great as the acquisitions have been, still greater results are to follow. When we look at the advance in strawberry and grape culture, and the numerous fine kinds which have been originated from seed within a few years, who is not desirous of renewing his efforts in the prosecution of this good work.

It is strange that Duhamel had so little confidence in obtaining good pears from the natural seeds, and we cannot account for his ill success in any other way except that of sowing the seed of poor varieties. But thanks to Van Mons for his enterprise, although the improvement which he claimed from the process of amelioration by sowing the seeds of successive generations of the pear, we believe came from the natural crossing of his best sorts in the same grounds. On my own part, I have to say, that could my life be prolonged for another four score and three years, I would devote them all to the promotion of this most benevolent and interesting employment.

Every year affords us an additional evidence, in the acquisitions of new and valuable kinds, and of the ease with which they may be possessed. These are the only methods by which we can expect to obtain new and improved fruits or to produce substitutes for those which may in time become deteriorated and unprofitable for cultivation. The process of hybridization is simple, whether by the air, insects, or the hand of man, and we have only to have due regard to the characteristics of the parents from which we breed; *plant the most mature and perfect seeds of the most hardy, vigorous, and valuable varieties; and as a shorter process, insuring more certain and happy results, cross or hybridize your best fruits.*

Plant the best seeds of every good fruit,
Good fruits to raise, all lands to suit,
Fruits which shall live, their blessings to shed
On millions of souls when we shall be dead.

These are creations that do the world good,
Treasures and pleasures with health in our food,
Pleasures which leave in the mem'ry no sting,
No grief in the soul; no stain on Time's wing.

For fruitage and flowers let praises arise
From earth's utmost bound to heav'ns highest skies,
Songs of rejoicing where'er they are found,
Songs of thanksgiving where'er they abound."

Taking Up Fruit Trees.—In taking up fruit or other trees for transplanting, the first thing to be done is to open a trench around the tree from two to five feet from it, according to the size of the tree, and the spreading nature of the roots. Some trees have the rootlets extending much further than others, different varieties of trees differing fully as much in this respect as the manner of growth of the branches. The trench should be open at sufficient depth to reach if possible the extremities of the spreading roots. An occasional straggling root that extends at a great distance from the trunk may be cut off with a sharp knife. Care should be taken however not to cut off any of the roots too near the trunk, or sever too many. It should also be remembered that it is by the delicate and tender extremities of the roots that trees take up their food, and that the tree is injured more or less by the breaking or bruising of any of their little points, hence the less we disturb the roots and soil about them, the better for the tree.

If we should remove a tree with every fibre entire, it would scarcely afterward show any sign of a change having been made. The small and delicate fibres should therefore be preserved as far as possible in taking up the tree, and the transplanting be done as soon afterward as practicable. The soil between the trench and stem or trunk of the tree should be removed as far as may seem necessary or practicable, care being used not to break or otherwise injure the roots, the roots, as fast as they are liberated being laid on one side, thus working around the trunk. The tree will then be ready to lift from the ground, unless there still be roots that extend downward. When such is the case, further digging may be necessary to a certain extent; when at a suitable distance from the trunk the root may be cut off, and the tree taken out of the ground. When practicable, it is best to secure a portion of the soil with the roots, so as to disturb them as little as possible, and prevent their drying, if the tree is not to be immediately transplanted.

Preparation of Soil for Transplanting Trees.—It is highly important that the soil for fruit trees should be such as is adapted to their healthful and perfect growth. It is surprising to note the effect of different soils upon trees and plants, each variety of soil ever holding true to its character; hence, if we wish to plant an orchard in a soil not adapted to the variety of fruit desired to be located there, we must change the nature of the soil, or the conditions naturally affecting it in an unfavorable manner. Nature can be relied upon with safety in this respect, as also upon the changed condition to which the soil may be brought, if that condition is continued, thus entirely changing its original quality or condition.

This renders it safe for those who understand the principles that apply to engage in fruit culture, or any other department of plant growth in agriculture. Notwithstanding the great diversity of soil, this ability to change its character,—even that which may seem almost worthless,—enables persons of every locality to raise their own fruit successfully, of such kinds as are adapted to the climate. Some plants and trees require a wet soil, others dry, but the greater number of those most important to agriculture avoid these extremes, and require a medium in this respect. Some trees keep their roots near the surface, others penetrate more deeply. In preparing the soil for their reception these facts must not be ignored. The character of the land must be studied, and the trees or other crops adapted to it, or the land be made to suit the crop. To ignore all this, and make no distinction, applying the same treatment to all crops indiscriminately would, to say the least, be inconsistent, and be sure to end disastrously. Deep drainage is essential to all wet soils before an orchard can be grown upon it with any degree of success. Unless this preparation is first made, the ground being

cold and wet, the roots cannot penetrate the necessary depth into it, but will be forced by the cold too near the surface, and hence will be affected by the extremes of heat in summer and cold in winter, deriving but little benefit from the soil below the shallow strata of earth they occupy. The trees under such circumstances may grow well for a time, but the conditions are unnatural and uncongenial, and such orchards will invariably be short-lived and unprofitable.

When the soil is such that the roots can penetrate deep into it and find a congenial element of growth and sustenance, it will also admit of thorough cultivation, and the plow may be used close up to the tree without striking and tearing the roots, which will thus have a wide, deep range, secure from heat and drouth in summer, and cold in winter; hence there is a healthy and vigorous growth, and such orchards, other conditions being equal, are long-lived and productive. Thorough preparation of the soil should be made if necessary before setting out an orchard; this can be afforded, since it is to last during the lifetime of the trees, and not like grain and other crops to be repeated yearly. In deep, rich, mellow soil but little preparation will be necessary. Some of the most successful fruit-growers recommend land for orchards where a hoed or grain crop has been grown a year or two previous. Green lands where the sod has been turned under six or eight months before the time of transplanting, thus having had sufficient time to become decomposed, is also good.

It is quite essential that the soil should either be deeply plowed or spaded. Trees may also be planted in sod land when necessary; in such cases, if the sods on being replaced, are reversed, and covered with a thick mulch, they will generally rot in a short time. In digging the holes for setting the trees, care should be used to make them large and deep enough to give plenty of range to the roots. The good surface soil should be kept separate from the poorer subsoil, the surface soil to be well worked in about the roots, the subsoil not to be used at all if of very poor quality. It is a good plan to put bones lightly covered with soil in the bottom of the holes which, being under the roots, will by their gradual decomposition furnish nutriment for the growing trees for years. Wood ashes, muck, partially or thoroughly decomposed chip dirt are also excellent, these being much better than stable manure for the purpose. Strong or unfermented manure should never be placed in direct contact with the roots, but if used should be first covered with the soil. As trees are so long-lived they are well worth careful planting.

An extensive fruit-grower says: "The best fertilizer to use in setting fruit-trees of all kinds is partially or thoroughly decomposed chip dirt. We made use of the material for the first time some twenty years ago in planting an apple orchard, and it was a wonder to those not in the secret what caused the trees to make such a fine growth the first season, and afterward, too, for that matter. The experiment was so satisfactory that when we set out our new orchard, we made a liberal use of this material, with the same satisfactory result. These trials have proved to our satisfaction that chip dirt is the very best material to mix in the soil as you plant the tree that can possibly be used, for the reason that it holds moisture, and is full of plant food; therefore, it promotes a most luxuriant, natural, and healthy growth. Repeated trials have satisfied me that a tree is not only more likely to live, but will make double the growth the first year (especially if a dry season) if some two bushels of chip dirt are properly used in its setting, than it would without it. A single trial will convince the most skeptical that the best possible use that can be made of this valuable material is to apply it to the soil in planting trees in order to push forward the tree during the first precarious stages of its growth."

Always select the most vigorous trees for planting. If there are any bruised or broken roots, it is well to cut them off before planting, always cutting from the under side, the bottom of the excavation being regulated to leave the soil a little the highest in the center. Arrange the roots as far as possible in their natural position, the trunk being steadied by the land, the lowest roots being first sought out and laid outward in radiating lines from the

stem and distributed equally on all sides; fine, rich soil should be thrown upon the roots as they are thus placed and covered. The soil covering the roots should be gently pressed down, and another set of roots higher up be laid in the same manner, and so on, until all the roots are well covered, and firmly imbedded in the soil. The tree should never in being planted, be pulled up and down, to settle the soil, as is sometimes done, but the soil should be carefully and firmly pressed around them, either with the hands or by gently treading upon it. When the excavation is two-thirds filled, it is a good time to place a support for the stem of the tree, either by a single stake or three, according to its size.

Water should also be turned in and allowed sufficient time to settle the soil closely about the roots, after which the hole may be filled up and the soil pressed down with moderate treading. When well set the surface should be left slightly rising towards the stem of the tree, to allow for the subsequent settling of the soil. When the soil is well settled the trees should be left about the same depth as they originally grew, except dwarf pear trees, which by planting from two to four inches deeper than the original depth a larger growth can be obtained. In planting an orchard, avoid placing the trees in the same spot or near where an old tree previously stood, since the vigorous growth of the young tree will require an element from the soil that has already been largely extracted in promoting the growth of the former tree; hence if occupying the site of the old tree, the growth of the young tree will be slow and feeble.

Fruit trees are generally planted in the spring from the middle of March to early in May, and in the fall from early in October until as late in the season as the ground will admit. When the planting is done in the fall, it will be of great benefit to the trees in a cold climate, especially during the first season, if a mound of earth, a foot or more high be raised about the trunk as a protection. When the planting is done in the spring there are many trees that will produce a much more rapid and strong growth the first season, if at the time of planting or immediately after, the trees are pruned, cutting out all except from three to five of the main branches and then from a third to a half of the previous year's growth. In fall planting this pruning should be deferred until spring. By setting out a few fruit trees every year a good supply of fruit can be had continuously on any farm, while the labor and expense attending it would be comparatively very slight. The old trees of the orchard should be removed as fast as they become useless.

Proper Size of Trees for Transplanting.—With respect to this subject, Mr. Downing says: "The proper size for transplanting varies somewhat with the sort of tree and the kind of culture intended. It is, however, a maxim equally well settled, both among theorists and the best practical men, that health, immediate vigor, and duration are all greatly promoted by transplanting fruit trees of small size—from three to six or seven feet. We are fully aware with what impatience the beginner, or a person who knows little of the culture of trees, looks upon trees of this size—one who is eager to plant an orchard and stock a garden with large trees, thinking to *gather a crop the next year.* The latter may indeed be done; but the transplanting so affects the tree that its first scanty crop is followed by a long season of rest and feeble growth, while the plantation of young trees is making wood rapidly, and soon comes into a healthy and long-continued state of productiveness—often long indeed before the large trees have fairly arrived at that condition. The small tree, transplanted with its system of roots and branches entire, suffers little or no check; the older and larger tree, losing part of its roots, requires several years to resume its former vigor. The constitution of the small tree is healthy and unimpaired; that of the large is frequently much enfeebled. A stout and vigorous habit—what the nurserymen call a *good stocky plant*—is the true criterion of merit in selecting fruit trees for transplanting.

Trees intended for orchards, being often more exposed than those in gardens, should be somewhat larger—not less than six nor more than eight feet is the best size. For gardens,

all experienced cultivators agree that the smaller size is preferable; we prefer plants two years old from the graft. Most gardeners abroad, when they select trees with more than usual care, take what are called maiden plants — those one year old from the graft — and there can be no doubt that, taking into account health, duration, and the ease with which such a tree can be made to grow into any form, this is truly the preferable size for removal into a fruit garden. But we are an impatient people, and it is not until after another century of trial and experience in the culture of fruit trees that cultivators generally in this country will become aware of the truth of this fact.

The facility with which the different fruit trees may be transplanted differs considerably. Plums are generally removed with most success, and after them nearly in the order as follows: Quinces, apples, pears, peaches, nectarines, apricots, and cherries; the latter succeeding with some difficulty when of large size."

Resuscitating Trees and Plants. — When trees and plants have become dry and shriveled from their roots being long exposed to the air before transplanting, they may be resuscitated by burying them entirely in damp soil for two or three days, or placing them in water for from twelve to twenty-four hours. When received from the nursery in a frozen state, let them thaw out gradually in a cold, damp atmosphere, or in cold water.

"Heeling In" Trees and Plants. — It may sometimes happen that packages of trees and shrubs will arrive from the nursery before the ground is ready for transplanting. Under such circumstances it is frequently the practice with fruit growers to what is termed "heel in" the trees, etc. The well-known nurseryman, Mr. R. H. Haines, recommends the following method of doing it:

"Dig a trench 12 to 18 inches deep, and place the roots of the trees in it, with tops reclining at an angle of 45 degrees. Cover the roots with soil, and, in the new trench thus formed, place another layer of trees, and so on, until all are 'heeled in.' If trenching them in, in the fall, to remain all winter, the soil should be well filled in among the roots, and banked up high over them."

Distances Apart for Planting Trees, Shrubs, etc. — The distances apart for planting trees, etc., will depend, of course, upon the variety and the amount of space required for their successful growth. Allowance must be made for their mature growth, and for the admission of air and sunlight, overcrowding to be carefully avoided, this being the fatal mistake too frequently made in transplanting. The following distances are generally regarded as the standard:

Apples,	30 to 40	feet by	30 to 40	Raspberries,	3½ or 4	feet by	3½ or 4
Apples (dwarf),	8 to 12	"	8 or 10	Raspberries,	6 or 7	"	5 or 6
Pears (standard),	18 or 25	"	18 to 20	Blackberries,	5 or 6	"	5 or 6
Pears (dwarf),	8 or 12	"	8 or 10	Blackberries,	7 or 8	"	2 or 3
Plums,	14 to 18	"	14 to 18	Currants,	3½ or 4	"	4 or 5
Peaches,	14 to 18	"	14 to 18	Gooseberries,	3½ or 4	"	4 or 5
Cherries,	18 to 25	"	16 to 20	Strawberries, for field culture,	1 to 1½	"	3 to 3½
Quinces,	8 to 14	"	10 to 14	Strawberries, for garden culture,	1	"	2
Apricots,	14 to 18	"	14 to 18	Rhubarb,	3 or 4	"	2 or 8
Nectarines,	14 to 18	"	14 to 18	Asparagus,	2 or 3	"	1 or 1½
Grapes (stakes),	6 or 8	"	6 or 8				
Grapes (trellis),	8 to 16	"	10 to 16				

The number of trees or plants required for an acre can be obtained by multiplying the number contained in one row by the number of rows. Another method is to divide the number of square feet in the plot to be planted by the number of square feet to be given each tree or plant; thus, strawberries planted three feet by one occupy three square feet of ground each, and since an acre contains 43,560 square feet, this number divided by 3 gives 14,520 as the number of plants required for one acre. Multiplying the distance in feet between the rows by the distance the plants are apart in the rows, will give the number of square feet occupied by one tree or plant.

Plans for Orchards or Fruit Gardens. — An excellent plan for laying out orchards is to plant apple trees from thirty to forty feet apart each way; then in the rows, half way between, plant a Standard pear. Crossways, half way between the apple trees, a peach or dwarf-growing tree may be planted. Opposite the pear trees some small tree could be set, such as the dwarf pear, plum, peach, cherry, or quince. Small fruit, such as raspberries, blackberries, currants, or gooseberries may be planted in each row of trees, and three or four rows of strawberries in each space, thus utilizing the entire surface. By the time the apple trees will require most of the ground the peach and dwarf trees, as well as the small fruit, will be through bearing, while the pear and cherry trees — the branches of which are of upright growth, requiring comparatively little room — will not be apt to interfere with the apple trees. The following plan is recommended by Mr. Wm. Parry, of New Jersey, well known in the horticultural world, who says:

"The advantages of planting fruit trees on this plan will readily be seen. By setting the apple trees thirty feet apart, and filling in with smaller-growing trees, the Standard pear occupying the space between the four apple trees, and, being an upright, pyramid grower, they do not interfere with each other.

O	D	O	D	O	D	O	D	O	D	O
D	S	D	S	D	S	D	S	D	S	D
O	D	O	D	O	D	O	D	O	D	O
D	S	D	S	D	S	D	S	D	S	D
O	D	O	D	O	D	O	D	O	D	O
D	S	D	S	D	S	D	S	D	S	D
O	D	O	D	O	D	O	D	O	D	O

PLAN FOR ORCHARDS.

O, Apple. *S*, Standard. *D*, Dwarf Pear, Plum, or Peach.

One acre will contain, at 30 feet apart, 48 Apple Trees, 35 Standard Pears, 82 Dwarf Pear, Peach, etc.

Twenty years ago I planted an apple orchard, setting the trees forty feet apart each way; I then set a row of Richmond cherry trees each way between them, requiring three times as many cherry as apple trees; then a row of Dorchester blackberries in the rows and between them, being ten feet apart; then a row of strawberries between them, leaving five feet of space for cultivation. The next year the strawberries produced the only crop gathered, they yielding $200 per acre. The year following the strawberries yielded about half as much, and after picking the fruit the vines were plowed under, and turnips planted in July, which produced a good fall crop. The same year the blackberries commenced to bear a little, and sent up a vigorous growth of canes, which gave a full crop of fruit the succeeding year, and continued to do so for five years, yielding over $200 per acre annually. The next year they did poorly, and were removed, to give more room to the trees, which then sufficiently occupied the ground.

The cherry trees commenced bearing the third year, and have borne full crops every year since, the quantity increasing each year with the size of the trees. For several years the fruit has been worth from $200 to $300 per acre, and sometimes more. One year we contracted with the proprietors of a canning factory near by for the whole crop, at ten cents per pound; there were eighty trees to the acre, and many of them yielded seventy-five pounds each.

The apple trees have made a fine growth, and bear large crops of fruit. The cherry trees in the apple rows begin to crowd them, and will soon be removed, while those standing in the center of four apple trees will have plenty of room for many years, and can remain, leaving as many rows of cherry trees forty feet apart as of apples on the same ground. By pursuing the above plan, there may be taken from $200 to $300 worth of fruit per acre annually, before the apple trees acquire size enough to bear much fruit, and thus avoid the usual objection urged against the planting of apple orchards, viz.: that it requires so long a time before any profit can be derived from the land thus occupied. The same principle will apply to any distance between 30 to 40 feet, and each planter can decide for himself according to the ground to be devoted to fruit. As the heaviest draught upon the soil is when the fruit is ripening, if all matured at once they might exhaust it of moisture and nourishment; but as they ripen gradually, following in succession, the intervening showers supply each crop as well as if there were no other. By this plan we get 165 trees to the acre, and it is much easier and cheaper to fertilize and cultivate 165 trees on one acre than to have them spread over 5 or 6 acres, to say nothing of the land saved for other crops. Every farmer should have at least one acre of orchard on the above plan, which should yield $5 per tree. But at half that sum they will give more than $400 per acre, with less labor than other crops that yield but small returns."

Where the space is limited, such as in the suburbs of large towns and cities, a number of trees may be planted by setting out a row a few feet from the fence, and extending around the entire plot. Raspberries or other small fruit may be grown also to the fence and between the rows of trees. By setting dwarf or small-growing trees on the south side of a garden, a vacant space may be reserved in a small garden for vegetables.

In localities exposed to cold and severe winds, it is well to plant a row of rapidly-growing evergreens, such as pine or spruce, on the north and west sides of an orchard, as a protection, the trees being set from five to fifteen feet apart.

Ralph Waldo Emerson, in referring to this method of protection to fruit trees, says: "This shelter creates a new climate. The wall that keeps off the strong wind keeps off the cold wind. The high wall, reflecting the heat back on the soil, giv s that acre a quadruple share of sunshine,

> 'Enclosing in the garden square
> A dead and standing pool of air,'

and makes a little Cuba within it, whilst all without is Labrador." A high, close board fence on the north and west sides of an orchard will also prove a great protection from the cold winds, but for large orchards the evergreen trees, closely set so as to break the force of the wind, are better.

Mapping Orchards and Labeling Trees.—A small map of an orchard, giving the relative location and kinds of trees, will be found of great convenience. Such a map should be made at the time of planting, or shortly after, before the labels are obliterated or lost. The trees should all be labeled, but the wires of the labels should be put on quite loose and never be left on so long as to permit them to girdle the tree. Neglect in this respect has ruined many valuable trees. The most durable labels are made by writing on zinc with a common lead pencil. The form of label used by nurserymen in some localities consists of a triangular piece of zinc five inches long, three-fourths of an inch at one end, and tapering to a point at the other. The small end may be curled around a branch, and will easily keep its place, while it will expand as the branch increases in size, and thus girdling is obviated. Such labels can be easily cut out of a sheet of zinc with a pair of shears. When tin labels are used in place of zinc, the name should be written with a sharp-pointed nail or awl. It is a pleasure to know the names of the different varieties of fruit grown, while the fruit will often find a better market when the variety is known.

Cultivation.—It is quite as essential that fruit trees should receive cultivation as any other crop grown upon the farm. It is too frequently the case that after planting the trees they are left to care for themselves almost wholly. Frequent cultivation will add much to the growth of a young orchard, while the fruit, when old enough for bearing, will not only be more abundant, but of better quality. The cultivation should, however, be shallow in order not to injure the roots that lie near the surface of the soil. Col. Wilder maintains that ordinary farm culture will not produce the highest class of fruit, and says, "they must have garden culture, and with this they never fail. After thorough preparation, the cleaner the culture the better, and this should be shallow, so as not to injure the roots, but to preserve them near the surface."

It has been estimated that one plowing and five harrowings in a single season are equal, in their effects upon an orchard, to from ten to fifteen loads of barnyard manure. A shallow plowing in spring may be sufficient, and cultivators and harrows do all the work for the rest of the season. Seeding an orchard down to grass is not to be recommended, except it may sometimes be done, when necessary, in case of apple and cherry trees after they commence bearing, to check the growth of other fruit trees, and to secure productiveness after a too vigorous growth. Very good crops of plums, pears, and quinces may, however, be obtained when the fruiting trees are grown in grass, provided a good top-dressing of manure or other suitable fertilizers be applied each year.

Mulching.—This consists of covering the ground around the trunk of the tree with coarse material, such as straw, leaves, or litter from the barn-yard, which, by preventing evaporation, keeps the earth moist, and also the elements of growth in the soil in a soluble state; besides, the soil is also kept at a uniform temperature, all of which conditions are favorable to the growth of young roots and the production of good fruit. Mulching is an excellent practice for all transplanted trees, and especially for those planted in the fall or late spring, the roots thus being kept warm in winter, and secure from drouth in summer. It is also especially beneficial to young trees in the Southern States, where the hot sun in summer might cause them to fail after having made a fine start earlier in the season.

How to Promote Fruitfulness.—When it is desired to have fruit trees commence bearing sooner than they otherwise would, certain methods, more or less effectual, may be resorted to in securing this object. Mr. R. H. Haines, a nurseryman of extensive experience, gives the following directions as the result of his experiments in this direction: "The pinching in of side shoots is one of the best ways of causing fruit buds to form. Another method is to fasten a ligature tightly around some of the branches. Another plan is to bend the branches, keeping the tops fastened down with weights lower than the bases of the branches. Another way is to make a circle of a branch, fastening in that way for a while. By partially breaking or twisting young shoots, the sap may also be retarded from fruit buds.

If many trees are to be treated, then the more common way is to cease cultivation, and to sow the ground with clover or grass seed, allowing it to remain in sod for two or three years. Any of the above plans will cause the trees or branches treated to produce fruit while younger than they otherwise would, if fruit buds or spurs had previously been absent. *Pruning the roots* in the fall or winter by digging a trench half way around or entirely round the tree, is an excellent way for treating entire trees or orchards. The trench may be made from three to six feet out, according to the size of the tree, and leaf-mould, rich soil, or some compost may be thrown in before filling up. One pruning of the roots is usually sufficient, though in succeeding years it may also be performed if desired. A top-dressing of two bushels of salt per acre every year or two, or of lime, often seems to have a good effect in promoting fruitfulness, though less speedy and less certain than some of the above-mentioned methods."

Renovating Old Orchards.—Old, neglected orchards can frequently be made profitable for several years by proper care and cultivation. Too many moss-covered, barren orchards, that were formerly productive, are to be seen in many parts of the country, which, by proper care, could be made productive for years. The hard sod should be plowed up and made mellow, admitting the air and moisture, and a liberal supply of plant food in the form of manure may be applied. Barn-yard manure, muck, or loam, which has been used as an absorbent of the liquid manure of the stables, the material from the compost heap, decomposed chip-dirt, lime, salt, iron filings, etc., are all excellent for this purpose. If farmers would save more of both the liquid and solid manure from their stables that now are wasted, many of them would have three or four times the quantity for use that they now have for the different farm purposes. Give the old orchards a new and plentiful supply of food in a substantial top-dressing, and a great change in productiveness will soon be observed.

The moss should also be scraped from the trunks with a blunt hoe or a sheet of iron made to fit the tree. The borers may also be killed with a knife or wire. The bark of the trees should be washed with diluted soft-soap, mixed with a little sulphur, or potash water. All sprouts should be cut away from the base of the tree, and if pruning has been previously neglected, the decaying limbs should be sawed off; thus by thinning out the branches and admitting more sunlight, the roots will be better enabled to support a more vigorous growth in those that remain. By such treatment we have known old orchards to become apparently rejuvenated and brought into a fine state of vigor and productiveness.

Changing the Bearing Year.—With most varieties of apples, and also some other fruits, there is generally a heavy yield every alternate year, which is commonly termed "the bearing year." This is doubtless due to the exhaustion caused by the excessive crop produced; hence time is required for the tree to recruit, and collect a sufficient supply of the proper material from the soil, water, and atmosphere, to form a new supply of fruit buds, and contribute to their growth and full fruitage. When half the fruit is thinned out, leaving only a moderate crop, the fruit will not only be large and more perfect in form, but there will be a tendency to fruit production the following year; consequently if on the bearing year of a single tree, or a whole orchard, nearly all of the early formed fruit or blossoms are picked off, allowing them to remain on the alternate or non-bearing year, the habit of production in that year will usually be formed after a few such trials. This work is comparatively easy on young trees which have small crops and are more accessible than old ones, and is more likely to produce a permanent change than an old tree with fixed habits.

If a moderate annual crop is desired, the young fruit should be thinned out, if the trees are liable to overbear, and good cultivation given, together with an application, every spring or fall, of manure or wood ashes, salt, and oyster-shell lime to the soil above their roots. It is quite desirable to be able to furnish fruit for the market when there is a scarcity, since it will at such times command a much more remunerative price.

A fruit-grower in Pennsylvania gives the result of testing the above plan for producing crops on alternate sides of apple trees: "Many years ago a neighbor near me tried an experiment on his trees with complete success. His trees, as usual, bore more apples during the even year than he could make use of and in the odd year not enough. So he went to work and picked off all the apples he could see from the south side of the tree when they were about the size of hazel or hickory nuts. The result was that his trees for many years bore full crops annually *on alternate sides.* As I frequently saw the trees before and afterwards, I am satisfied that it was a success in his case. Probably this operation would succeed best if performed in the even year, or when the trees have too heavy a crop."

We see no reason why the above plan should not prove a success, although the quality of the soil, cultivation given, and other conditions largely modify the amount of fruit produced in any season.

Pruning.—When performed in the proper manner and at the proper time, pruning is very easy and simple work, but the indiscriminate cutting of trees, so frequently practiced under the name of pruning, is very injurious, and often ruinous to trees. Pruning is usually practiced for the purpose of regulating and improving the form of healthy, luxuriant trees, and of increasing the vigor of feeble trees. It increases the vigor of trees in two ways, first, by directing the entire supply of nourishment to a smaller number of branches, which cause them to grow with greater luxuriance; and by enlarging and expanding the small sap channels of weak, feeble trees, by having all the force of the circulating fluid thrown into a smaller number of branches and buds, thus causing larger sap-vessels, new and more luxuriant shoots, and adding increased vigor, which will be apparent for a long time. Pruning is especially valuable to small trees of a stunted growth, but it should also be judiciously performed in order to be beneficial and prevent injury.

Best Time for Pruning. — It is generally conceded by the most successful fruit growers that the best time for pruning, in order to promote growth and to insure a perfect and ready healing of the wood, is early in the spring, or as soon as the severity of winter has passed. If delayed until after the buds begin to swell, the sap being in full flow, there will be a loss of sap by bleeding that is very injurious to the trees in lessening their vigor, and in some trees causing a serious and incurable disease of the limbs. Fall pruning is usually done in the latter part of October, or in November, shortly after the leaves have fallen, but as previously recommended, it is better to have pruning deferred until the close of winter, before the buds begin to swell.

Summer pruning is applicable to young orchards, and when practiced consists of directing the main flow of sap into a few shoots in each branch by pinching off the ends of all other shoots when two or three inches in length. In pruning, it must be borne in mind that the direction in which a bud or shoot points, determines the direction of the growth of the branch. It is better to prick or break off these tender shoots rather than to cut them off with a knife or shears. Young trees that are pruned in this manner require but little pruning in the following spring, and then only for two or three years, after which time summer pruning will generally be sufficient.

Methods of Pruning. — Pruning should commence when the tree is quite small, and there should be a constant watchfulness to keep down all shoots which are not permanently wanted on the tree; by this means the tree can be trained into almost any form desired. We do not, however, approve of interfering much with the natural form of the tree, but to prune sufficient to eliminate such buds and shoots as shall appear in those places where it is not desired that they should grow, and to prevent a too heavy growth of limbs. Many buds may be rubbed or pinched off in summer, thus avoiding a waste of a season's growth in deferring pruning until the following spring.

The effort of the pruner should be directed towards removing all weak branches, and those that by crowding interfere with the growth of other branches. Such branches as are not allowed sufficient room for natural growth should never be left to attain a large size, thus taking that amount from the vigor and life of the tree before being removed, but should be taken early in their growth. It is easy to perceive that by taking off a limb two or three inches, or even an inch in diameter, is involving a needless waste of the vital forces of the tree; for if it had been removed when a tender shoot, the material used in forming such a branch could have been supplied to the permanent branches, and thus the forces all economized in increasing the vigor, size, and productiveness of the tree. Besides, the cutting off of a large limb causes a wound that will not readily heal, and frequently results in premature decay of the trunk.

In pruning, all the sprouts that do not seem strong and vigorous should be removed, or

those that attain a crooked growth. The top of the tree should not be left so dense in branches that when in full leaf the sunlight cannot enter to ripen the fruit. Fruit that grows in the shade is never as fine flavored or beautifully colored as that which is exposed freely to the sunlight. To go to the opposite extreme, and cut out the branches too much, leaving them too open, there will not be sufficient protection to the bark from the cold winter winds, and the burning heat of summer. Good judgment and an intelligent understanding of the business are essential to the most successful use of the pruning knife.

Mr. Downing says: "A judicious pruning, to modify the form of our standard trees, is nearly all that is required in ordinary practice. Every fruit tree, grown in the open orchard or garden as a common standard, should be allowed to take its natural form, the whole effort of the pruner going no further than to take out all weak and crowded branches; those which are filling uselessly the interior of the tree, where their leaves cannot be duly exposed to the light and sun, or those which interfere with the growth of others. All pruning of large branches in healthy trees should be avoided, by examining them every season and taking out superfluous shoots while small. Mr. Coxe, the best American author on fruit trees, remarks very truly: 'When orchard trees are pruned, they are apt to throw out numerous (superfluous) suckers from the boughs in the following summer; these should be rubbed off when they first appear, or they may easily be broken off while young and brittle — cutting is apt to increase their number.'

Where pruning is not required to renovate the vigor of an enfeebled tree, or to regulate its shape, — in other words, in case of a healthy tree which we wish to retain in a state of the greatest luxuriance, health, and vigor, — it may be considered worse than useless. Bearing in mind that growth is always corresponding to the action of the leaves and branches, if these are in due proportion and in perfect health, the knife will always be found rather detrimental to luxuriance and constitutional vigor than beneficial.

Ignorant cultivators frequently weaken the energies of young trees, and cause them to grow up with lean and slender stems, by injudiciously trimming off the young side shoots and leaves in the growing season. By taking off these shoots the stem is deprived of all the leaves which attract and elaborate the sap, thus preparing nourishment for the growth of the stem; and the trunk of the tree does not increase in size half so fast as when the side branches are allowed to remain for a time, pruning them away gradually. It is better, in the case of these young trees, to *stop* the side branches, when of moderate length, by pinching out the terminal bud."

We have seen trees so pruned that their form was shorn of all beauty and grace, and instead of being an ornament to the landscape, and a pleasure to the eye, as they should be, were really a blemish to the locality in which they were placed, and an offence to good taste and judgment. A sharp pocket-knife will be all the tool essential for pruning young trees for some time; but after attaining a larger growth, pruning shears and saw will be necessary. In pruning old trees that have been long neglected, it may be necessary to cut away considerable from the top in order to bring them into good form and thin out the branches sufficiently to admit the sunlight, and also to remove the decaying limbs.

Wash for Wounds made in Pruning. — In pruning large limbs, the wounds should always be covered with some kind of a wash or composition that will keep out the air, prevent the wood from cracking, and maintain it in a healthy, sound condition until a new layer of bark covers it. The following composition is the best we know for this purpose, as it soon becomes hard, adheres closely to the wood, is not affected by the weather, while at the same time it does not prevent the new bark from gradually closing over the wound, and covering it: Dissolve as much gum-shellac in a quart of pure alcohol, as will make a liquid of the consistence of paint, and apply it to the wood with a brush, being careful to have the surface

smooth, and well covered. If kept in a well-corked bottle, it may be preserved any length of time, and be conveniently at hand when needed.

Propagation. — The most common means for propagating fruit trees is grafting and budding, although there are several different methods employed for this purpose. Strictly speaking, there are but two methods of propagating trees and plants, and these are by planting seeds, which is the natural process, and by the means of buds, which is for the most part an artificial process. The latter is the better method, since the seed of fruit will rarely produce fruit of the same kind, while a long time is also required for the tree to reach maturity; while by grafting a bud or scion into the branch of another tree, the fruit that may be produced will be very similar to that of the original source. Less time is also required for the grafted bud or scion to reach a bearing age, than for the seed to produce a natural tree. Grafting consists in inserting a scion of one variety or species on a branch or stem of another, the latter being called the stock. The latter may be of all ages from a seedling of a year's growth to a full-grown, aged tree, but in order to insure success the stock should be sound and healthy.

The propagation of fruit by grafting is of very ancient origin, having been well known and practiced by the Greeks and Romans, and although many new methods have been devised since that period, many of those described by the Greek and Roman writers are fully as ingenious as those employed at the present time. It is said that the French, who are noted for their skill in grafting, are familiar with from fifty to seventy-five different methods of propagating fruit and plants by this means. The principal methods employed for propagating specific varieties of the larger fruits are by grafting and budding; and for small fruits and vines are by cuttings, layers, and runners, the use of buds being required in all of these methods.

The tools used in grafting are a light, sharp, small-toothed saw, to cut the branches, a sharp chisel to smooth the surface, a broad, stout-bladed knife to split the stock, a light mallet or hammer to drive the blade in making a cleft in the wood, a pot of grafting wax, and a ball of strips of narrow cloth to bind around the stock after the scions or buds are inserted.

Benefits Derived from Grafting and Budding. — The benefits derived from grafting and budding may be briefly summed up as follows: By this means the valuable kinds of fruits that are not easily raised from seeds or cuttings, may be rapidly propagated; hence, new varieties, when obtained, may be quickly introduced to all sections suited to their growth. By this means, also, a comparatively worthless tree may be made to produce the choicest variety of fruits in from two to four years. By grafting several varieties of fruit on the same tree, a succession of from early to late fruits may be obtained in a small garden, and from few trees. Certain tender and delicate varieties may be made more hardy by grafting them on to robust stock, and also to grow in a climate not naturally adapted to them. Grafting also hastens the bearing of seedling varieties of fruit which would be a long time in arriving to a full-grown, bearing tree; hence, a seedling pear or apple that might require from twelve to eighteen years to arrive at the bearing period, may by grafting it on to the extremity of the branch of a mature tree, produce fruit in from three to four years. Dwarf fruit trees may be obtained, when desired, by grafting certain kinds of fruit on suitable trees of slow growth.

Selecting Scions. — Repeated experiments have demonstrated the fact that in nearly all kinds of grafting by scions the highest success is attained when the tree upon which the scion is grafted is a little more advanced than the scion itself; therefore, in order to have the sap of the tree to be grafted in a more active state than the scion, the latter is generally cut

some time before being used, such as very early in the spring, during the winter, or even in the autumn. As soon as cut, they should be put in a dark, damp place, to prevent drying. The best method is to bury the lower ends in the ground in a dark part of the cellar, or cover them entirely with fine soil in the cellar until wanted for use. Some recommend that they be cut in the fall, when the leaves are fallen and wood is ripe, and be preserved through the winter by burying them in the earth in a dry soil, below the reach of the frost. In cutting the scions for use, the most thrifty and straight shoots of the previous season's growth should generally be selected, although it is claimed by many that there are special advantages to be derived from using wood of two seasons' growth. Each scion should contain at least two buds when subdivided, but they should not be subdivided until ready for use, as they will remain in a more thrifty condition if left entire until that time. In cutting, an inch and a half or two inches of wood should be left above the last buds, to prevent them from drying up by the shrinking of the wood. Never select scions, however vigorous they may seem, from a sickly and unhealthy looking tree or branch, as such will be very likely to develop an unhealthy condition in their future growth. In selecting from old trees, always choose the most vigorous of the last season's growth that are found near the center or top of the tree, since these will be apt to have more natural vigor than those growing from the side branches. Those taken from the lower bearing branches are thought by many to produce fruit soonest, but they will not prove as vigorous or thrifty as those from the center or top of the tree, neither will they produce trees of so fine a form as the latter. When practicable, choose the scions from young, thrifty trees in preference to old trees, however vigorous they may seem. Care in selecting good scions will well repay by the after-vigor and healthfulness of the trees.

The Kind of Stock for Grafting Upon. — Although scions or buds of different kinds can be made to grow upon a variety of other trees, yet they will thrive best and prove most productive when grafted upon those for which they have an affinity, and to which they are allied. There should therefore be a relationship between the stock and the scion, the structure of the wood being similar, such as the varieties of the same species, as the different kinds of apples grafted upon each other; next removed from this would be the grafting of the different species of a genus, as the apple and the pear, in which case there will be a growth, but not as complete and permanent as with those of the same species. Farther removed still would be a union of the genera of the same natural family, such as the cherry and the plum, which scarcely ever survives the third season. Apples are usually grafted on to apple or crab seedlings for standards, or dwarf stock for dwarfs; such as the Paradise apple, or Doucain's pears on pear seedlings for common culture, or quince for dwarfs; peaches on those of their own kind; apricots on apricot seedlings or plum; nectarines on the peach or plum, etc. Trees to be grafted should have been standing at least a year, as newly transplanted trees will not give as good results. Trees to be grafted should always be thrifty and vigorous.

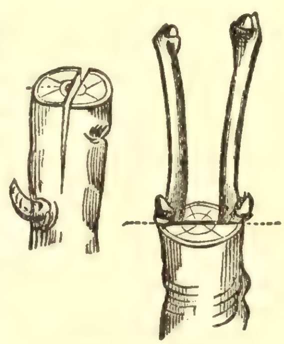
The Best Time for Grafting. — The proper time for grafting fruit trees is in the spring, as soon as the sap commences circulating. This varies with different varieties, being much earlier with the cherry and plum than with the apple and pear. The time also varies, of course, with the season and climate, but is generally from February to the middle or last of April. The most favorable weather for grafting is a mild temperature, with occasional showers, which prevent the drying up of the scion before a sufficient union takes place between the woody parts to enable the latter to be nourished by the sap of the tree into which it is grafted. Root grafting is frequently practiced in the house in winter or early spring, the roots afterwards being placed carefully in a damp cellar until the time of planting them out in the spring. This method, however, is only when the root is small, and the whole of it is devoted to supplying nourishment to the graft.

Methods of Grafting.—The science of grafting is based upon the ability to produce a union between the tissues or forming matter of the growing wood. In order to accomplish this, the parts should be placed in perfect contact, so that the sap of the stalk, in ascending, passes directly into the scion, thus sustaining its life. The buds of the latter, being thus stimulated, begin to put out, woody fibers are formed between the parts in contact, which eventually unite the graft firmly to the stalk. De Candolle says in relation to this union: "If the descending sap has only an incomplete analogy with the wants of the stock, the latter does not thrive, though the organic union may have taken place; and if the analogy between the albumen of stock and scion is wanting, the organic union does not operate, the scion cannot absorb the sap of the stock, and the graft fails." There are various methods of grafting, among the principal of which are whip or tongue, cleft grafting, splice grafting, saddle grafting, side grafting, root grafting, budding, etc.


WHIP OR TONGUE GRAFTING.

Whip or Tongue Grafting.—This is one of the most common methods of grafting, and is very easily performed. The scion and branch to be grafted are first cut in a sloping manner, upward on the stock, and downward on the scion, being made to correspond so that when placed together the bark of the two joins evenly. The knife is then passed upward in the scion, and downward in the stock, forming a sliced-tongue appearance, as represented in the cut, the incision serving to hold the scion in place when properly placed. They are then bound together with a narrow strip of cloth (about half an inch), which is wound tightly around the stock, while the whole is finished by covering with a coat of grafting wax (about half an inch thick), extending it fully an inch above and below the wound. This excludes the air and moisture, and prevents drying and loss of sap where the wound has been made. There are other methods of whip grafting; for instance, where the scion does not correspond in size with the stock, when the former is joined at the side or at the end of the stock, according to the comparative size of the two.

Cleft Grafting.—This method of grafting is frequently practiced on large stocks, or trees, the branches of which are too large for whip grafting. The stock to be grafted is first sawed off horizontally, and made smooth with a knife or sharp chisel. A cleft is then made in the stock about two inches deep. This may be done with a splitting knife and hammer or wooden mallet. The scions are then cut at the lower end in the form of a wedge, the wedge being made about an inch and a half long, leaving it a little thicker on the outer edge, and so trimmed that the bud is left on the outside and close to the junction of the stock and graft. The scion should also be left two or three inches beyond the bud, to prevent the latter from withering by the drying up of the wood. The cleft is then opened with a small chisel or splitting knife, and the scions carefully inserted at each end of the cleft, when the stock is large, fitting the inner bark of the scion to that of the stock. As the chisel is withdrawn, the scions are held firmly in place. After being thus set, the end of the limb and sides of the cleft should be well covered with grafting wax, and the whole bound up. The point to be gained in cleft grafting, as well as all other methods, is to have the inner bark of the scion exactly meet the inner bark of the branch upon which it is grafted, for unless a perfect fit is made the sap of the stock will not nourish the graft, and consequently it will soon shrink and die.


CLEFT GRAFTING.

Splice Grafting. — With this method of grafting it is essential that the branch to be grafted correspond precisely with that of the scion, so that the two pieces of wood perfectly fit the bark, joining evenly. There should be a smooth, sloping cut made upward on the stalk, and downward on the scion. When laid, the one upon the other, and the inner bark of the one corresponds exactly with that of the other, bind them firmly together with a flat strand that will not cut into the bark, and cover the wound entirely with grafting wax, extending the covering of wax fully an inch above and below the place of joining. The two form a union quite readily when skillfully performed, leaving scarcely any wound to heal.

Saddle Grafting. — In saddle grafting, the end of the stock is cut into the form of a tapering wedge, and the end of the scion cut upward to fit it perfectly, so that the inner bark of the one may fit that of the other. The wound is then wound with strips or bands, and the whole covered with grafting wax, as in methods previously described. This mode offers the largest surface for the junction of the scion and stock, and is generally attended with success where other methods have failed.

Side Grafting. — Side grafting has been attended with excellent results in the magnolia and other trees difficult of propagation; also where the grafting has been delayed until quite late in the spring. It consists of cutting a slit from one to two inches in length in the bark at the side of the stock, and cutting the scion in the form of a slender wedge, so paring it that in inserting there will be a union of the bark and wood, leaving the top of the branch to maintain the circulation of the sap until the graft has become well united, when the stock should be cut away.

Root Grafting is a mode sometimes practiced where the object is to increase the variety rapidly, or where other means of propagation are not available. In such cases the scion is grafted directly upon a portion of the root of some suitable stock, the latter being of sufficient size to furnish nourishment to the scion, although the best results are generally attained when both scion and root are rather small. The tops of the roots to be grafted should be cut down close to the crown; then cut the roots into pieces from four to eight inches long. The scions are then cut into pieces three to four inches in length. The scion and the root should be as near the same size as possible where they join, so that the bark will come together on both sides. The fitting of the surfaces to be joined may be according to whip or tongue grafting, splice grafting, or saddle grafting, as previously described. Grafting paper may be made by melting together one pound of rosin, one-half pound of beeswax, and one-half pound of tallow, which, when well melted and mixed, spread while hot upon one side of a newspaper with a brush, and when cold cut the waxed paper up into strips half an inch wide. Wind a strip of this waxed paper around where the root and scion joins to hold them in place, and insert them in a pot of fine, moist soil, being sure to press the root and scion firmly together, and have them held tightly in place. If the waxed paper does not stick well at first, place it in the warm sun or near a fire, but not sufficiently near to melt the wax. They will need to be handled carefully, not to be misplaced. If the buds of the root and scion do not match on both sides, which is the best way if possible, it is very essential that they should on one side. In covering with soil, all but the upper buds of the scion should be covered, so that the lower ones or the wound may not be exposed to the atmosphere. When grown together, they can be transplanted whenever desired. Root grafting may be done in winter, and the grafts properly labeled, packed away until the time of setting in the spring, in boxes in fine soil, or sand and sawdust, putting the boxes in a cool, damp place in the cellar, where they will not freeze or commence to grow. They should be examined occasionally, and if the buds show any signs of shriveling moisten slightly with water. New varieties of grapes may be grafted upon the roots of wild grapes or the common

sorts in this manner, always being sure to leave at least three buds on the scion, and when set in the ground having two eyes well covered with the soil. The two principal points to bear in mind in this mode of grafting are to press the surfaces to be joined closely together, so that a union can be easily effected, and to set the scions deep in the soil. Dahlias and peonies may be grafted upon each other, by inserting young shoots into the neck of one of the fleshy roots of each kind respectively, the cut for the insertion being triangular in shape and made at the upper end of the root. It should be just large enough to admit the young shoot, when cut at the end in a wedge shape, to fit the incision.

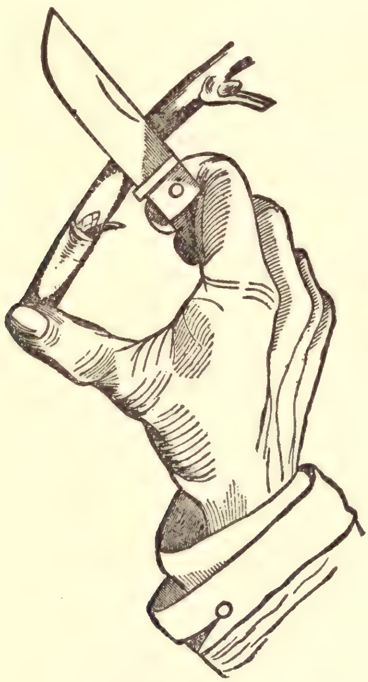
Grafting Wax.—The best kind of grafting wax is made of equal parts of tallow, beeswax, and resin melted together. Its quality is greatly improved by thoroughly working it with the hands when cold. A little more tallow than the other ingredients will render it more pliable, if desired. Some prefer a larger proportion of resin than the above named. This wax may be applied directly to the graft, or it may be spread with a brush when in a melted state, upon cloth or paper, which may be afterwards cut into suitable strips for wrapping around the wound. Grafting clay is sometimes used in place of grafting wax, but the latter affords a much better protection, besides being neater, and is greatly to be preferred. Liquid grafting wax may be made ready for use and kept in a bottle for years, by heating one pound of resin slowly, and adding one ounce of beef tallow; when a little cooler, stir in a tablespoonful of spirits of turpentine, and then add seven ounces of alcohol while still warm. Should it become thickened by keeping, it may be thinned by warming slowly, and adding more alcohol.

Budding.—Although a different process from the modes of grafting previously described, budding does not differ from either in its nature or effects, the principal difference being that in grafting we use a scion having several buds, together with a quantity of bark and wood, while in budding but a single bud is used, to which a small quantity of bark and wood are attached. The advantages of budding, compared with those of grafting, consist in the rapidity with which the former may be performed; the more convenient season for doing it, since it can be delayed beyond the hurry of spring work in the nursery or on the farm; of its being done without injury to the branch; and the opportunity of repeating it on the same stock if the first effort proves ineffectual. The season for budding trees in this country is in the summer, from the first of July to the middle of September, the earlier trees requiring it sooner than those that open their leaf and blossom-buds later. Budding may also be done in the spring. In all cases the bark must separate easily from the stocks that are to be budded, so that it may be lifted without injury. The principal methods of propagating by this means are shield and annular budding.

Selecting Buds.—It is highly important that the buds for budding trees be taken from healthy, vigorous shoots, and well developed. Mr. Downing says: "In choosing your buds, select thrifty shoots that have nearly done growing, and prepare what is called a *stick of buds*, but cutting off a few of the imperfect buds at the lower, and such as may be yet too soft at the upper ends, leaving only smooth, well-developed single buds; double buds being fruit-buds. Great care is essential in selecting buds, as often, even on sticks cut from young trees, and especially from bearing trees, many of the single buds will be found developed into fruit-buds, and are therefore unfitted for use. The form of a wood-bud is always long rather than round, and, in the case of peaches, there are sometimes triple buds, the centre one of which is always a wood-bud. Cut off the leaves, allowing about half an inch of the foot stalks to remain for conveniently inserting the buds."

Shield Budding.—With this method, an incision is made in the stock from an inch to an inch and a half in length, and at the top of this a cross is made, the whole forming the letter T. The north side of the stock is usually taken for this purpose, when convenient,

as it is less exposed to the sun. Select a bud from the scion, and with a sharp budding knife, cut a thin, smooth slice of wood and bark containing the bud. Raise the bark on each side of the incision of the stock carefully, just wide enough to admit the bud, and slip the prepared bud gently under to the bottom of the incision. If the upper portion of the bark of the bud projects above the horizontal incision, it should be cut off so as to fit the place completely. Strips of cloth, woolen yarn, and other soft material should next be tied over the wound firmly so as to hold the bud in its place, pressing the bark close to the wood, and leaving the bud only exposed to the light. In two weeks after the operation the bud will look plump and fresh if alive; the bandage may then be loosened, and if the branch has swelled much, it may be removed altogether. If on the other hand the bud has failed, it will look shriveled, and if the bark parts readily another trial may be made. When budding is performed late in the summer it may be well to leave the bandage as a protection during the winter.



CUTTING A BUD.

PREPARED STOCK AND BUD.

As soon as the buds commence swelling in the following spring, the branch budded should be headed down with a sloping back cut within two or three inches of the bud. This will cause the bud to make a vigorous start, as it will then be nourished with a larger amount of sap than otherwise. The shoots near the bud should be removed also, that they may not rob the bud of the nourishment it should receive from the stock. It is a good plan to tie the buds with two distinct bandages, one above the bud and another below. In this case the lower bandage may be removed as soon as the bud has taken, the upper one remaining some time longer, and by its pressure arrest the sap flowing upward in the branch, contributing to the growth of the bud.

The conditions essential to success in budding may be briefly summarized as follows: 1.— The buds must be from healthy, vigorous stocks, and perfectly developed in the axils of the leaves on the young shoots from which they are taken, and the wood must be well matured and ripe. When the wood is not sufficiently matured, it can be made so in the course of a

week or two by pinching the tips of the shoots and thus arresting their growth. 2.—The bark must separate easily from the stocks to be budded so as to be lifted from the wood beneath it without injury. 3.—The bud with its slice of bark must be perfectly separated from the scion without injuring the eye or center of the bud where it is attached to the wood. 4.—The bark containing the bud, and the bark of the stock must be brought close together in order to secure the necessary healing of the wound, and the attachment of the bud to the stock. 5.—The wound must be protected by a bandage to exclude air and foreign moisture. Choice varieties of roses and other plants may be propagated by budding, as well as fruit and other trees.

Reversed Shield Budding is simply making the horizontal cut at the bottom of the incision of the bark instead of at the top, and does not seem to possess any advantage over the former.

Annular or Ring Budding is frequently practiced with trees of hard wood and thick bark, or that have buds of such large size that shield budding would be a difficult operation. By this mode, a ring of bark is taken from the stock, and a ring of corresponding size containing a bud is taken from the scion and inserted in place of the former; in cutting the ring, care should be used not to cut too near the bud, but to leave sufficient space above and below it,—perhaps from an eighth to a quarter of an inch,—to protect it. If the ring from the scion should be too large around or too small, it may be cut to fit the stock by shortening it, or be pieced out by a strip of bark added. Bandages should be applied the same as with previously described modes.

ANNULAR BUDDING.

Propagation by Cuttings.—This mode of propagating fruit trees consists of planting scions in the ground, by which means they take root at the extremity, thus becoming a new and perfect plant. All fruit trees and vines may be propagated in this way, but some will grow much more rapidly than others, a few only growing sufficiently fast in this way to render their propagation by this means desirable. Those that may be the most successfully propagated in this way are the currant, gooseberry, grape vine, quince, fig, and mulberry. Cuttings of the currant, gooseberry, and hardy kinds of grapes will take root very readily in the open garden in a soil that is not too dry.

One of the best authorities on this subject gives the following directions: "Currants and gooseberries are generally taken off in the fall or winter, prepared for planting, and two-thirds of their lower ends buried in the ground till the commencement of spring, when they are planted out, either where they are to remain or in nursery rows. They will succeed nearly as well if taken off in the spring, but, owing to the period at which they commence growing, this must be attended to *very early*, if deferred till that season. A successful practice is to prepare the cuttings of gooseberries and currants early in the autumn, and to plant them at once in the position where they are to grow the succeeding summer. In planting, set the cuttings into the ground so deeply that but one bud will be left at or near the surface, and then, as soon as the frosts of winter come, cover the whole ground with a light mulch of straw manure, or other litter three or four inches deep.

In order to raise plants of the gooseberry and currant, with straight clean stems, which shall not throw up suckers, it is only necessary, before planting the cutting, to cut out every eye or bud to be placed below the surface of the ground. The cutting should be about a foot long, eight inches of which may be inserted in the ground. To insure a greater success in raising the finer sorts of gooseberry, or other shrubs, it is customary to plant the cuttings on the shaded side of a wall or fence, in deep rich loam, rather damp than dry. Cuttings of the vine are generally prepared when trimming the old plants in autumn or

winter; they may then be buried with their lower ends in the ground, or kept in earth in the cellar till spring. Grape cuttings are also made as soon as it will answer to prune the vines in the autumn; and being planted at once in the ground, covered as above noted for gooseberries and currants, are found to grow successfully.

Scarce sorts of grapes, which it is desirable to multiply extensively, are frequently propagated by joints: that is, by buds having about two inches of wood attached to each—every bud in this way forming a plant. When this mode is adopted, it is usual to plant the joints about half an inch deep, in light soil, in a common hot-bed prepared for the purpose, or each joint is planted in a pot by itself. In the first way a greater number of plants may be grown in a small space. As a general rule, cuttings succeed best when they are taken off just between the young and the previous year's wood; or, in the case of young side shoots, when they are cut off close to the branch preserving the *collar* of the shoot. The lower end should be cut smoothly across just below a bud, the soil should in all cases be pressed firmly about the lower end of the cutting, and it should always be planted before the buds commence swelling, that the wound may in some measure heal before growth and the absorption of fluid commences."

Propagating by Layers and Suckers.—A layer is a branch or vine not separated from the plant, which is bent down and covered with soil for the purpose of having it take root, and thus the variety be propagated. There are many kinds of plants that do not grow readily from seed, or take root from cuttings well, that can be readily rooted in this way. Raspberries, blackberries, and many varieties of grape vines are more easily propagated by this means than any other; there are also many kinds of fruit trees that may be treated in the same manner. Fruit trees are usually layered in the spring, the layers becoming well rooted by autumn, when they may be taken off if desired; but they may also be layered with good success as late as the early part of July.

When raspberries, blackberries, and similar plants are to be layered, it should not be done until the tips of the plants grow nearly free from leaves, and are of a dark, purplish color, which will be in August or September. In making layers, the ground around the parent plant should be made mellow with a spade. Then bend down a branch so that it will lie upon the ground, and make a little trench three or four inches deep to receive it, cover with soil and press it down, keep the end of the branch a few inches above the ground. Some kinds of plants that are layered will take root much more easily by making a slanting cut half way through the upper or under side of the shoot before covering it with soil, since the descending sap in the branch is somewhat arrested at this point, and causes little fibres and rootlets to put out rapidly. Ringing, twisting, or slightly wounding a limb answers a similar purpose, although not as well. Fastening the branch down with a hooked peg before covering with soil helps to hold the branch in place more securely.

Thinning Fruit.—It is too frequently the custom with farmers, after setting out fruit trees, to leave them to care for themselves; they are therefore left to live or die, without pruning, culture, or care of any kind. The result of this treatment is that of those trees that survive many become diseased from the attacks of insect enemies, their growth is retarded, while the fruit will be of poorer quality and less abundant than if proper care were given. The trees are allowed to overbear, being heavily laden with fruit one year, with little or no fruit the next, the vital forces of the trees being so excessively stimulated by the growth and ripening of the fruit during the bearing season, as to require a rest the following year to recuperate. Besides the failure of the fruit crop the following year from overbearing, this over-production involves another difficulty; exhaustion follows, and the wood that is formed during the season does not become fully matured or ripened, and is consequently frozen during the winter; hence there are few blossoms that are put out the following spring. When

left constantly to themselves this habit of bearing every alternate year becomes permanent; consequently there will be an excess of fruit one season, and a scarcity the next.

The remedy to be found for this difficulty is in thinning the fruit as soon as it is fully set, or at least, very early in the season, before the tree has expended much of its vitality in the nourishment and growth of the young fruit. If delayed too long, these energies will all be wasted, and but little good will be accomplished. Some fruit-growers clip off the blossoms or small fruit with pruning shears. The experiment of beating off the blossoms with a long pole has been thoroughly tested, and is not satisfactory, since this is liable to injure permanently the bearing twigs. The most satisfactory method of thinning fruit, both as to results and labor involved, is to pick off the fruit by hand as soon as set, dropping it upon the ground. Considerable labor will of course be involved by any method of thinning, but the good results that follow fully compensate for it, especially with the choicest varieties of the orchard.

By thinning fruit in this manner, trees may not only be made to bear every year, and the evils of overbearing obviated, but fruit thus grown will be of better quality, larger, and more perfect in form than when the trees are left to themselves. Good sized and perfectly formed fruit will bring a much better price in the market than two or three times the same quantity of imperfect fruit. For further information on this subject we refer the reader to methods recommended for CHANGING THE BEARING YEAR.

Gathering and Assorting Fruit.—Like all other crops produced upon the farm, (which require harvesting in a proper manner and at a suitable time), the value of fruit will depend much upon the care it receives at the time of gathering. Many farmers cultivate fruit of good quality who are not able to keep it through the winter, simply from carelessness in gathering, or from its not being gathered at the proper time. Fruit that is gathered before being properly ripened, or so late that it has become affected by the frost, or that is bruised or imperfectly sorted, will neither keep well or command the best market price, however well it may have been cultivated. A large amount of fine fruit is lost yearly by carelessness at the time of harvesting, and storing in unsuitable places.

The time of picking fruit of course varies with different varieties and the purpose to which it is to be appropriated. A large amount of early fruit found in the markets is picked while so green that its flavor and quality are greatly impaired. Most fruits that are transported from a great distance must of necessity be gathered before becoming fully ripe in order to bear transportation. Oranges, for instance, that are found in the Northern markets are very different in flavor from those that have been permitted to ripen on the tree. The same may be said of apples, peaches, and many other kinds of fruit. Pears, however, are an exception to the general rule, and are much more juicy and fine flavored when picked before being mellow. Winter fruit, whether for market or family use, should be picked when quite hard, but apples of the early varieties should be allowed to become mellow on the trees, unless they are to be transported a long distance.

Early ripening apples that are picked when sufficiently hard to bear a safe transportation to a distant market, could hardly be recognized as the same variety as those that have been permitted to ripen on the tree. All kinds of late ripening fruit should be gathered before the appearance of severe frost, for fruit that has become frost-bitten in the least will decay in a short time; however, the gathering should be delayed as long as possible with safety from frosts, as it will be better under such circumstances. Winter pears will, however, endure a greater degree of cold than apples with safety, but they should not be exposed to a hard frost. Choice fruit of all kinds should be picked by hand, and never shaken from the tree, since any bruises, however slight, will soon cause fermentation to set in, followed by premature decay.

Fruit should be gathered in dry weather, or, if gathered when wet, it should be allowed

to dry before being stored for winter use, or packed for market. Even when picked by hand, it should be handled with care, and never be *thrown* into the basket or sack for receiving it, but carefully laid down, for if dropped only a few inches upon other fruit, it will be more or less bruised. Such bruises may be so slight as to escape notice, but they will be sufficient to cause premature decay. In removing from the sack or basket in which it has been put when picked, the same care should be observed with all fruit that is designed for long keeping, or that may be easily bruised. Never turn it out of a basket or sack into a barrel, for by so doing, each specimen will become more or less injured. It is well to spread apples or winter pears for a few days or weeks in some cool, dry, suitable place, such as the floor of a store room or barn, before they are put away for winter use, since a moisture will gather upon them for several days, which, unless dried off, will cause premature decay. This gathering of moisture is called the "sweating" process.

An opportunity is thus afforded, also, for carefully selecting and grading the fruit before storing for winter. Unless properly assorted before marketing or storing, imperfect specimens will be mixed with the sound fruit, and by their decay will soon cause the latter, with which they come in contact, to decay also. In packing fruit, such as apples, pears, or peaches, in crates or barrels for market, the latter should be gently shaken occasionally while being filled, so as to fill up all the vacant spaces possible, and prevent bruising by being shaken about in transportation. When closely packed, so that it cannot move about, fruit may be transported any required distance without injury from bruises.

Storing Fruit.—Before storing, fruit should be properly assorted, and all imperfect specimens separated from those that are fair and sound. The large and small should also be put in separate barrels, whether for storage or market. Care should also be taken that the fruit, before storage, is perfectly dry; since moisture, whether from dew, rain, or the natural sweating process, is not favorable to the keeping qualities of fruits of any kind. Some fruit-growers in packing winter fruit for storage, take especial pains to wipe each specimen with a soft cloth to remove all moisture before putting it in bins or barrels. Others, in storing choice winter fruit, wrap each apple or pear in a piece of paper, that it may not come in contact with others. Some consider a layer of fine cut straw between the layers of apples in barrels or bins, as tending to promote their keeping qualities. Better than either is to arrange fruit, such as winter pears or apples, on the shelves of a fruit room or hanging racks, where they will not come in contact with each other, but be constantly surrounded by a dry, cool atmosphere. Packing in plaster is a very good means of preserving fruit. A recent writer gives the result of his experiments as follows:

"I have been experimenting the past few years with apples, and find those packed in plaster keep much longer than any other way I have tried. I use flour barrels, and find them preferable to apple barrels, as they are made tighter. I first cover the bottom of the barrel with plaster, then a layer of apples, then cover with plaster, and so on till the barrel is full; then put the head in and drive the hoops tight. The plaster, being of a cold nature, keeps the fruit at an even temperature, and being fine and dry, packs so close as to keep the apples air-tight. I had Northern Spy and Swaar almost as fresh in May as when picked, and found no decayed one, and think they would have kept till early apples were ripe, had we not used them. Shall put up several barrels for next spring and summer use, as I am satisfied that our best varieties, such as Steel's Red Winter, Wagener, and Seek-no-further, will keep several months longer than by putting them up without plaster, and will retain their flavor much better beside."

The rule for storing all fruit is to keep it dry and as cool as possible without freezing; also at an even temperature. A damp cellar is a very unsuitable place for fruit; none, however good, can long be kept sound in such a place,—a cool and dry atmosphere being absolutely essential to its preservation.

Fruit Rooms.—A fruit room constructed in connection with an ice house, so as to be kept cool by means of the latter, is an excellent place for the storage of fruit. The best we have seen of this kind was constructed inside a large ice house, so arranged that ice was stored on the sides and overhead, while ample means were provided for drainage below by the use of pipes underneath the floor, and a condensing tube inside the fruit room. By this method the temperature could be kept at all seasons just above the freezing point.

Preserving fruit on a large scale in this manner would of course involve considerable expense and care, which would be beyond the means of most farmers and fruit growers. Mr. R. H. Haines, whose opinion on subjects pertaining to fruit we have had previous occasion to quote, gives the following directions respecting the construction of an inexpensive fruit house: "If under the house, it is well to have the ceiling plastered to prevent unhealthy effects from decaying fruit. If under the barn or stables, or in them, then all unpleasant odors should be kept away from the fruit. They should always be arranged so as to let in cool air when desired. If convenient, it is better to have apples kept in a separate apartment, but not necessary. Sometimes a small building can be cheaply made into fruit rooms, by filling in the siding with sawdust, or spent tan-bark. If erecting a building on purpose, then the walls and ceiling should be double, using tongued and grooved boards inside and out, and filling in with six inches in width of sawdust, etc. If good drainage can be obtained, it is better to heap up the earth high around the outside. The floor may be either of boards, gravel, or cement. The building should have double windows and doors, so as to be kept warm in winter, and cool in summer.

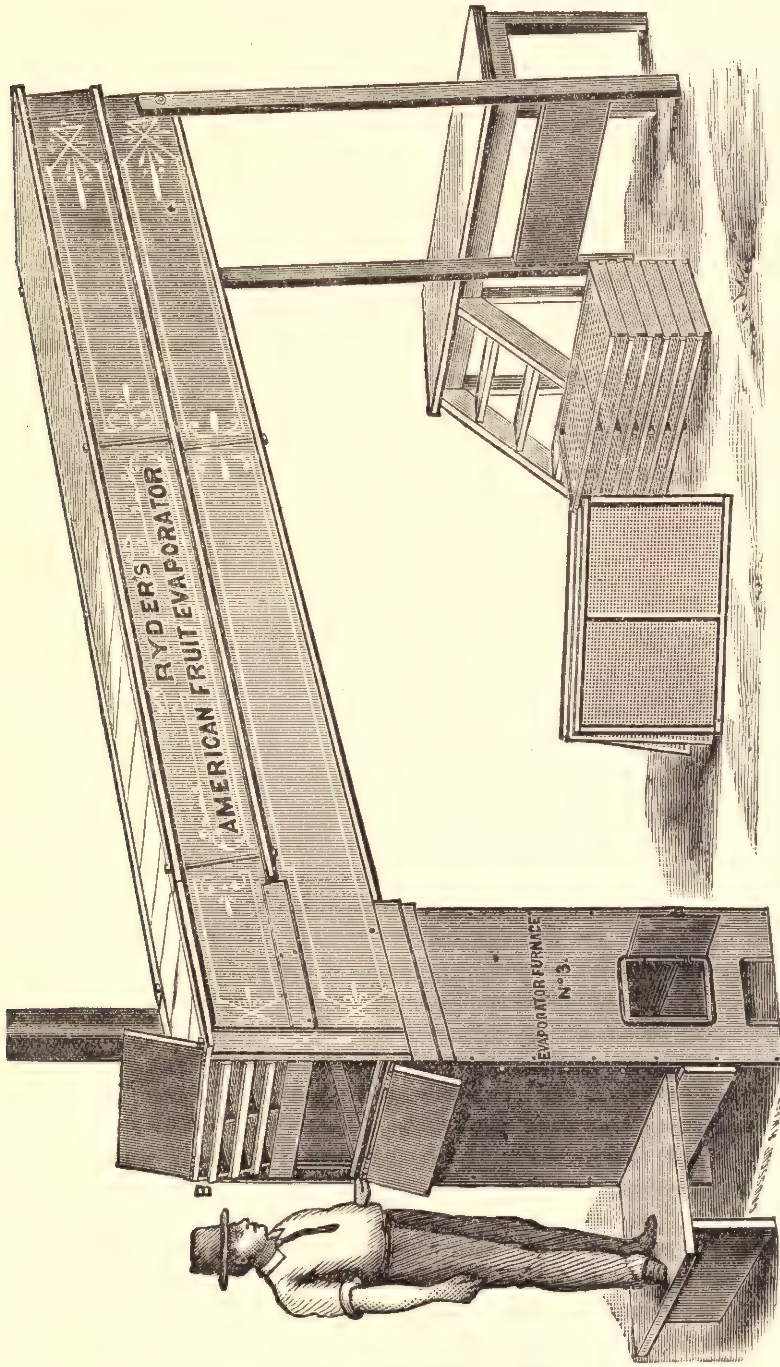
Another method is to have the fruit house in the side of a hill, making the walls of brick or stone, and having a double roof, packed between with one or two feet of salt hay or sawdust. It is well to have the roof reach pretty near the ground. Even a small house, ten or twelve feet square inside, and eight feet high, will hold a large amount of fruit, and when kept cool inside will keep early apples or pears until winter, and winter apples for a year or more. When properly made and regulated, a fruit house will add greatly to the enjoyment to be obtained from fruits."

Drying Fruit.—In fruit growing sections, it has long been the custom to dry a portion of the fruit product in order to preserve it from decay for future use. Thus apples, peaches, pears, currants, berries of various kinds, etc., have been dried and preserved for almost any desired length of time; but the old-fashioned method of drying possessed many objections, since it involved a vast amount of labor, and too frequently the quality and flavor of the fruit was greatly injured by the process, which sometimes required several days to complete.

The net-work of suspended apple and pumpkin that slowly dried in the unwholesome drafts of our ancestors' chimneys, or the compound of decomposed fruit, insects, and dust, that after a fortnight's exposure to the sun, rain, and dew on the roof or fence, or the rattling, partially charred product of the oven which represented American dried fruits, are fast being abandoned, and no longer furnish our markets as the representatives of our fruit-drying industry. A better method has been devised, which is destined to supersede the former, since it preserves the flavor of the fruit without impairing its quality, while the drying process requires but a very short time.

This process is by evaporating the moisture of the fruit quickly by currents of dry, hot air, without cooking it in the least, or changing its flavor; thus apples, peaches, pears, plums, cherries, berries, etc., when dried in this manner and afterwards soaked in water to regain their former plumpness, when cooked, can scarcely be distinguished (if distinguished at all) from the food manufactured from fresh, ripe fruit. Numerous fruit-evaporating machines are in use, which have not only greatly lessened the labor and improved the quality of dried fruits,

but have contributed largely to the fruit drying industry of the country. The following represents a machine of this kind manufactured by the American Fruit Drier Manufacturing Co., Chambersburg, Pa. They are made of all sizes, suitable to extensive fruit drying establishments, or for family use.



FRUIT EVAPORATOR.

With these machines, the moisture is soon removed without overheating or breaking the cell structure of the fruit, while there is no partial fermentation, as there is always when fruit

is dried in the sun. The fine flavor of the fruit is retained, and as nothing but water is removed, the addition of water restores the fruit to its original condition as far as any dried product may be restored to that condition for culinary purposes. The weight of a bushel of apples after being dried in a fruit drying evaporator, will be only from six and a half to seven pounds, and one hundred quarts of blackberries will weigh only about forty pounds. This is a very convenient method of preserving fruits that perish quickly, since when cured in this manner they can be packed away in jars, boxes, or paper bags where they may be safe from insects, and be kept any length of time until wanted for use, while during those seasons in which there may be a surplus of fruit, a quantity may be preserved in this manner and kept until a season of scarcity, when it will command a good price in market, or if preserved simply for home use, be very useful for household purposes.

Protecting Fruit Trees and Vineyards from Frost. — To retard the blossoming of fruit, and thus secure protection from frost, it is a good plan to heap up a body of snow and ice around the trunk and roots in cold weather, say February or March, or to mulch deeply when the ground is well frozen. This will have a tendency to retain the frost in the ground later, consequently the fruit buds are retarded in opening until past all danger from spring frosts. Another method of keeping off the frost, is to make a dense smoke near the trees or vineyard by making small fires and burning gas tar, straw, wood, etc., to prevent rapid radiation from the ground. Carriage sheets, light blankets, or paper are sometimes thrown over small trees and vines to protect them from frost, but this is scarcely practicable where there are many that require protecting.

THE LARGER FRUITS.

The Apple. — Of all the different varieties of fruit grown in the temperate zone, the apple stands first in importance, being the most extensively cultivated of any, and embracing the most numerous varieties. From the most remote periods of antiquity, this fruit has been renowned, and ancient poets and writers speak of it as being endowed with superior virtues. There is probably no portion of the whole world in which the apple thrives so well, and attains such a degree of perfection, as in the northern and middle portion of the United States, the choicest apples of Germany and northern Europe scarcely equaling many varieties that have originated in this country. The source from whence all the different varieties of apples have originated, is a species of crab-apple growing wild in most portions of Europe. Although there are two or three varieties of the crab-apple growing wild in this country, these have not been used in propagating the apple here; it came from seeds of the species that were brought here by the European colonists.

The apple tree is very hardy, of slow growth, and long-lived. In its wild state, it is a very long-lived tree, but when cultivated the average period of life is from fifty to eighty years; by good care an apple orchard can be kept healthy and productive even much longer. It is, therefore, the best policy in planting an orchard to take pains in securing the best varieties suited to the section grown, and give the best of care. Although generally a tree of medium-sized growth, it sometimes attains enormous proportions. It is stated by the best authority that on the grounds of Mr. Hall, of Raynham, Rhode Island, are two apple trees that are more than one hundred and forty years old; the trunk of one fourteen years ago, measured at one foot from the ground, thirteen feet two inches in circumference, and the other, one foot less. These old trees bore fourteen years ago between thirty and forty bushels of apples; but in the year 1780 (when nearly forty years old), they together bore one hundred and one bushels of apples. An apple tree in Duxbury, Massachusetts, has been known to yield in a single season one hundred and twenty-one and a half bushels; this tree has a girth

of twelve feet and five inches. Another in Lehigh County, Pennsylvania, is said to measure seventeen and one-half feet in girth one foot above the ground, is fifty-four feet high, with branches extending thirty-six feet each way from the trunk. No fruit is more abundantly produced or generally liked than the apple, while it is exceedingly wholesome and nutritious. The slight care required for its culture also renders it valuable. The earliest varieties ripen towards the last of June, and the latest, when properly stored, can be preserved until that time, so that with suitable varieties and good care, it is a fruit that may be had during the entire year.

Propagation. — The usual mode of propagating apples is described by Mr. Downing as follows: "The apple for propagation is usually raised from seeds obtained from the pomace of the cider mills, and a preference is always given to that from thrifty young orchards. These are sown in autumn, in broad drills, in good mellow soil, and they remain in the seed beds — attention being paid to keeping the soil loose, and free from weeds — from one to three years, according to the richness of the soil. When the seedlings are a little more than a fourth of an inch in diameter, they should be taken up in the spring or autumn, their tap-roots shortened, and then placed in nursery rows, one foot apart, and three to four feet between the rows. If the plants are thrifty and the soil good, they may be budded the following autumn, within one or two inches of the ground, and this is the most speedy mode of obtaining strong, straight, thrifty plants. Grafting is generally performed when the stocks are about half an inch thick. When young trees are feeble in the nursery, it is usual to head them back two-thirds the length of the graft, when they are three or four feet high, to make them throw up a strong, vigorous shoot. Apple stocks for dwarfs are raised by layers.

Apple trees for transplanting to orchards should be at least two years budded, and six or seven feet high, and they should also have a proper balance of head or side branches."

Soil, Site, etc., for Apple Orchards. — Apple trees will thrive on a variety of soils, but will not do well on the two extremes, viz.: on very dry sands, or soils saturated with moisture. The soil that the apple seems to prefer most, and the one in which it attains its highest degree of excellence, is a rich loam of a calcareous or limestone character. It has been found that the best flavored fruit, the most abundant crops, and the longest lived trees are produced from a deep, rich, gravelly, marshy, or clayey loam, or a strong, sandy loam on a gravelly subsoil. Soils that are too damp may be rendered suitable for apple trees by thoroughly underdraining, and those that are too dry by deep subsoil plowing, where the subsoil is of a heavy or clayey nature.

The site chosen for an orchard should depend upon the climate. In the Northern States a southern or southeastern slope is to be preferred, thus securing the warmth of the sun to ripen the fruit and wood, while a protection from the cold northwesterly winds is thus partially afforded. In the Southern portions of the country, or where the climate is hot and dry, apple orchards will be found to flourish best on the northern slope, where the trees will be less exposed to the hot sun, and more moisture be derived from the soil. All young orchards should have the soil kept mellow and loose by cultivation, at least for a few years, until the trees become well established, and if the cultivation could be renewed every year during the life of the trees it would well repay for the labor. When the plow is used, the cultivation should be shallow, in order not to disturb the roots that lie near the surface. A disc or acme harrow is excellent for this purpose. For information respecting the transplanting, cultivation, and pruning of apple orchards, we refer the reader to general directions on this subject already given in connection with fruit culture.

Varieties. — There are at present about three thousand named varieties of the apple, while new ones are being constantly produced. Among the varieties most commonly pre-

ferred some thrive best in one locality and others in another, so that it would be impossible to name such as are best adapted to all sections. Indeed every State, and certain localities in every State, will generally be found to have special fine varieties peculiarly adapted to it, and which might not thrive equally well in other sections. It is the common mistake of farmers, in establishing market orchards, to plant too many ill-adapted varieties. Of whatever varieties chosen, it is better to have but a few of the choicest that are best adapted to the locality. The quality of any variety is largely modified by the soil and climate, and hence the necessity of obtaining those that are suited to the location. Some of the finest varieties known to the Northern States would be almost worthless when grown at the South, and a few kinds that succeed well at the North are of but little value in the Middle States. The farther south the apple tree is taken, the earlier it will ripen; hence the choicest kinds of winter apples grown at the North would not be of much value at the South. It would be impossible, in a work like this, to describe all of the leading varieties of apples of different localities; in fact, such a description would require quite a volume in itself. We will, therefore, mention some of the leading varieties adapted to the localities designated. For the *extreme* North, such as Northern New England and Canada, the most hardy varieties should be cultivated, such as, for summer fruit, the TETOFSKY, a large, yellow, tart apple that ripens in August; the LARGE EARLY BOUGH, a fruit above medium size, pale, greenish yellow in color, flesh white, sweet, sprightly flavor, which ripens from the middle of July to the second week of August; YELLOW TRANSPARENT, a good and productive kind for summer market; and DUCHESS OF OLDENBURGH, a sub-acid variety, of good quality, very hardy and prolific. Among the winter varieties adapted to the extreme Northern section are the WEALTHY, very hardy, sub-acid, tender, juicy, and with excellent keeping qualities; MAGOG RED STREAK, acid, good quality, hardy, thrifty, and an excellent bearer; SCOTT'S WINTER, an excellent keeping apple, being equal to the Roxbury Russet, and replaces it in very cold climates. It remains hard until April, and when properly stored will keep until July in a fresh, crisp condition. The MEANDER'S WINTER, TRANSCENDENT, LADY ELGIN, ALEXANDER, CLARK'S ORANGE, and SIBERIAN CRAB are also remarkably adapted to a cold climate, being very hardy; they are also each of good quality of fruit.

Among the varieties that are *nearly*, although not quite as hardy as the above-mentioned varieties, and are adapted to Northern sections, although not to the *extreme* cold climate, are the RED ASTRACHAN, a large, red, acid apple, ripening the last of August; SUMMER HARVEY, resembling the Rhode Island Greening in flavor and color, ripening the last of August; WILLIAM'S EARLY, of medium size, red, mild flavored, ripening the last of July to the first of September; FAMEUSE, RIBSTON PIPPIN, EARLY JOE, PRINGLE'S SWEET, PORTER, HOLDEN PIPPIN OR FALL ORANGE, MAIDEN'S BLUSH, and EARLY HARVEST, all of which are either summer or autumn ripening varieties; while the winter varieties of equal hardiness are the ST. LAWRENCE, BEN. DAVIS, NORTHERN SPY, JONATHAN, and TALLMAN SWEETING. For sections between the very extreme Northern and the Southern States numerous varieties are adapted, such as the BALDWIN, RHODE ISLAND GREENING, ROXBURY RUSSET, SEEK-NO-FURTHER, NORTHERN SPY, GREEN NEWTOWN PIPPIN, STEEL'S RED WINTER, GILLIFLOWER, SPITZENBURG, WAGENER, CANADA RED, WHITE WINTER PIPPIN, YELLOW BELLFLOWER, NONESUCH, PUMPKIN SWEET, GOLDEN SWEET, HUBBARDSTON, GRAVENSTEIN, FALL ORANGE, FALL PIPPIN, CANADA REINETTE, etc. The Roxbury Russet is one of the best keeping apples known.

The varieties that have been the most highly recommended for the Southern and Southwestern localities by leading authorities are the EARLY HARVEST, NEWTOWN PIPPIN, FALL PIPPIN, TETOFSKY, RED ASTRACHAN, GRAVENSTEIN, BELLFLOWER, SHOCKLEY, GOLDEN RUSSET, RED LIMBERTWIG, SMITH'S CIDER, RAWLE'S JANET, STEVENSON'S WINTER, ENSINGER'S NONESUCH, and SWEET RUSSET, etc.

Every farmer should have several of the best varieties of apples for home use that ripen

at different times, from the earliest ripening to the latest; but for market purposes a few of the choicest kinds suited to the section should be cultivated, it being borne in mind that a few choice varieties are much more profitable than a large number of different kinds. The farmer who plants an orchard of fifty or one hundred trees, representing from thirty to forty varieties, commits a grave mistake. He will not only fail of having a good market for his fruit, since a few of the choicest will be in the greatest demand and command the highest prices, but at the time of gathering the fruit, the different kinds will need to be kept separate, which will require considerable extra care and labor, while there will be but a few barrels of any one sort. There will always be a few standard varieties that will meet with a more ready sale than others. More than three-fourths of the apples shipped to Europe from the United States at the present time are Baldwins, which shows the great demand for this variety. For home market, the Rhode Island Greening and Roxbury Russet are about as popular as the Baldwin; but the Roxbury Russet is not generally as productive as the other two mentioned varieties, yet has better keeping qualities. Standard varieties, however, will always meet with a ready sale.

Varieties of Crab Apples. — The crab apples will thrive in almost any soil, and are exceedingly hardy. They are very tender; hence they can be cooked with the skins on, and are among the richest cooking apples known. It is a wonder to fruit growers that this profitable and hardy fruit is not more generally cultivated. The tree is very ornamental, giving a profuse supply of beautifully shaded blossoms in spring, and in the autumn heavy clusters of richly colored fruit. The principal varieties are Aiken's Striped Winter, good quality, lasting from December to March; Hyslop, fruit large, deep crimson, ripens in October; Montreal Beauty, fruit very large and beautiful; Orange, one of the most popular varieties, and an excellent bearer; Transcendant, fruit very large, a very profitable variety; Van Wyck Sweet, a new *sweet* variety, skin yellow striped with red, large, and about the quality of the Tallman Sweet.

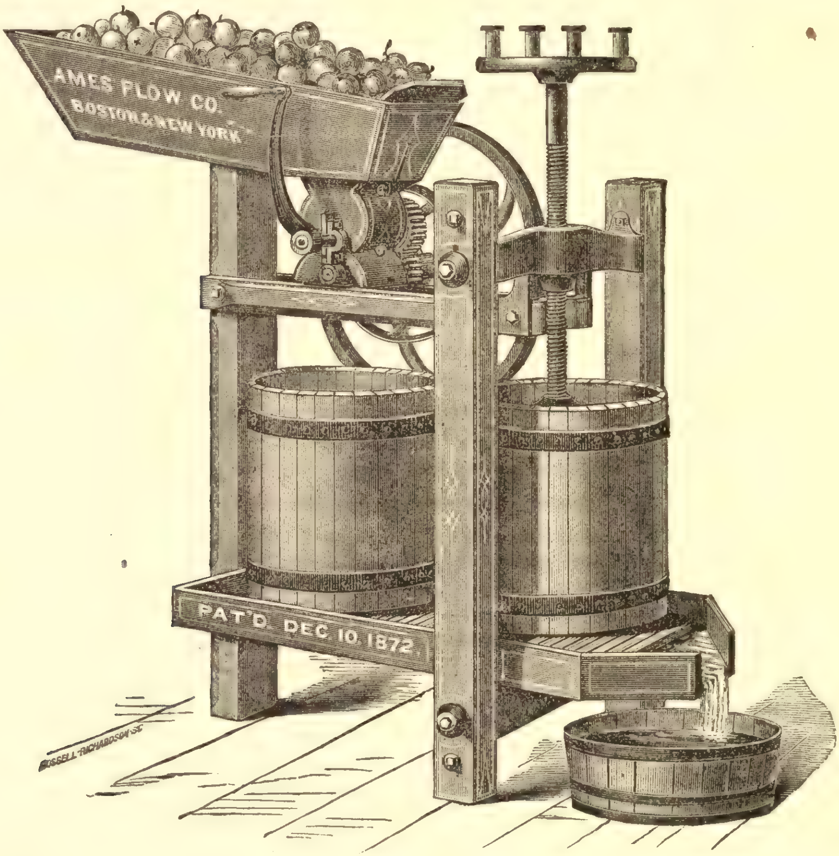
Storing Apples. — Suggestions concerning this subject will be found under the head of Storing Fruit.

Cider Making. — The method of manufacturing cider and the kind of apples used, make a vast difference with its quality. Cider that is the product of fruit which, besides being inferior, has perhaps been permitted to lie in piles upon the ground until half decayed, can neither be palatable nor healthful. Too many farmers are indifferent in this respect, and permit their cider apples to remain too long upon the trees, or lie through sunshine and rain in ponderous heaps upon the ground after being gathered, until half decayed, waiting for a convenient time to attend to the cider making. In fact, we remember, when a lad, of hearing an old Yankee remark, "I reckon that apples make a *leetle the best* cider, and a leetle more of it, that have a good many rotten ones mixed with 'em," an erroneous opinion prevalent in some localities, showing the perverted taste, as well as ignorance, of those who entertain such ideas. In order to make the best cider, good, sound, ripe fruit should be chosen, and the better the quality of the fruit, the better the cider. Nice winter apples, and such varieties as have rich juice and fine flavor, make excellent cider.

All apples will not make good cider, the early kinds and many of the fine dessert varieties being too juicy and watery to furnish a rich juice. The Roxbury Russet, Rhode Island Greening, Winter Pippin, Ben Davis, and Smith's Cider, are among the most popular varieties for this purpose. The addition of a few ripe quinces to the apples very much improves the flavor of cider, when a choice article is desired for bottling. All decayed, bruised, and wormy fruit should be rejected, and everything in its manufacture be perfectly clean. The fruit for cider should be gathered late in the season, or early in November, and care should be used in gathering to prevent the apples from being bruised when shaken from the trees.

To avoid this, before shaking the trees, it is well to lay coarse cloths or straw under them. After being gathered, the apples may lie in heaps upon the ground, or in sheds until perfectly ripened, but not sufficiently long to become decayed.

When ready for grinding, all the immature and rotten fruit should be rejected, and the remainder ground to a uniform mass. The pulp may remain with the juice in it a longer or shorter time, according as a lighter or darker color is required in the cider. The time



NATIONAL FARMER'S CIDER MILL.

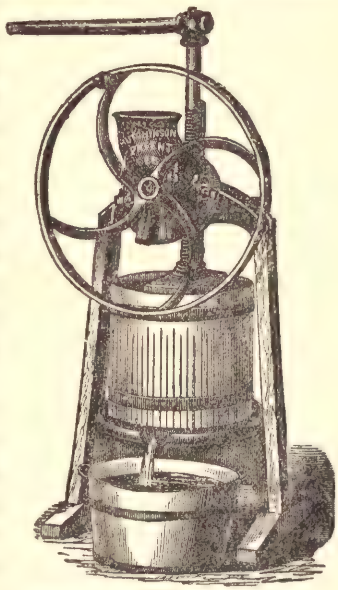
for allowing it to stand in the vat varies from twenty-four to forty-eight hours, and sometimes even longer, if the weather is cool, the color being heightened and the saccharine principle being increased by a little delay. The liquid should be pressed out (without wetting the straw) and strained through hair-cloth or sieves, into clean, sound casks that are perfectly sweet. The casks should then be placed in a cool cellar. Fermentation will commence in a few hours; in order to permit this to continue, the bung should be left out, and as the froth and pomace work out of the opening, the cask should be filled every day with cider of the same pressing kept for this purpose. In two or three weeks, — according to the temperature, —this rising of pomace, which is the fruit fermentation, will cease. The bung may now be put in loosely for a day or two, after which it should be driven in tight. The cider will then be clear, and should be drawn off and put in a clean barrel or cask.

In this state, there is danger of the fermentation proceeding too far, and for this reason it should be watched. If it remains quiet, it may stand for some time before bottling, frequently until March or April. At this stage of fermentation, a gill of finely-pulverized char-

coal is sometimes added, or an ounce of isinglass, a half ounce of whole grains of white mustard, or a half pound of raisins to each barrel, to clarify and refine the cider; but this is unnecessary when well made of apples suited to the purpose.

Bottling Cider. — The old-time rule for bottling cider was early in the spring, or just before the apple trees blossomed. The time of bottling, however, will depend upon the condition of the cider, or rather the degree of fermentation to which it has attained, which latter, of course, will depend upon the temperature at which it has been kept. The usual time, if kept in a cool cellar, will be from three to four months after leaving the press. Good, strong bottles should be chosen, for if weak, they will be liable to be broken from the pressure caused by the fermentation. Fill the bottles within an inch of the bottom of the cork. Fasten the cork in firmly, and place the bottles with their necks downward, in a cool cellar, in clean, dry sand, or lay them on their sides in bins or boxes with layers of sand between each layer of bottles. A piece of rock candy about the size of a hickory nut, pulverized and put in each bottle, is thought by many to improve the quality of the cider. Three or four good sized raisins added to each bottle, will also serve the same purpose.

Cider Wine. — The following method of making cider wine is simple, and furnishes an excellent quality of this article. Take sweet and sour apples of equal quantity, using the best of sound fruit for the purpose. The addition of a few ripe quinces greatly improves the flavor. Grind in a mill, and allow the pomace to stand twenty-four hours, stirring occasionally, so as to expose it to the air. After expressing and straining the juice, add a pound and a half or two pounds of refined sugar to each gallon of cider, and put it in a clean barrel for fermentation, leaving the bung hole open, and filling up the cask each day with the juice to permit the froth and pomace to work off. As soon as fermentation ceases, draw off and put in a clean cask, and carefully exclude the air; in about four months draw off and bottle.



HUTCHINSON'S FAMILY MILL.

Cider wine made in this manner is nearly equal to the best champagne wine, which it closely resembles. A small family mill for grinding the apples will be found of great convenience in making cider or wine from grapes, currants, or other fruit. The Hutchinson Mill, of which we give an illustration, will grind from eight to ten bushels of apples, and from ten to twelve bushels of grapes or currants per hour. The press will contain one and a half bushels of apple pomace, while as small a quantity of cider as desired may be made in a few moments.

Diseases and Enemies of the Apple. — The principal diseases and enemies of the apple are the apple-borer, caterpillar, canker worm, bark louse, wooly aphis, apple worm, or codling moth, twig-girders, the blight, and the apple-bark beetle, while in many sections mice, rabbits, sheep, and cattle, do considerable injury to young trees unless properly protected from them. For treatment of these, see special department on DISEASES AND ENEMIES OF FRUIT.

Pears.—The pear may very justly be regarded as one of our best fruits in point of quality, and as a favorite fruit of modern times. In its wild state, the choke pear is anything but a palatable fruit, and its present improved and perfected standard is a wonderful proof of horticultural science and skill. The pear tree is not a native of this country, but was introduced here from Europe. It grows wild in hedges and wooded wastes in Europe, Western Asia, and China, in connection with the apple, and in the wild state is more hardy and longer lived than the latter; hence, the common impression that pear trees are tender, and that it is

difficult to obtain a good quality of this fruit, is altogether without foundation. Pear trees live to a great age under favoring conditions. M. Bosc, in his writings, refers to several which are known to be near 400 years old.

Other writers mention a remarkable pear tree in Herefordshire, England, which, in 1805, covered more than half an acre with its branches, which, bending down, would take root, and in turn produce others in the same manner. It is also stated that more than once, fifteen hogsheads of perry (the juice of the pear fermented) have been made from this tree in a single year. The delicious qualities of this fruit were not developed to any great extent until the seventeenth century, while during the last century more has been done to perfect this choice fruit than all the time of its cultivation previous, although it has been cultivated in Europe and Asia fully two thousand years.

Van Mons devoted almost his entire life to the improvement of the pear, he having produced 80,000 seedlings by his own individual efforts, from among which many valuable and choice varieties had their origin. Others have devoted much time and attention to hybridizing or crossing, and attained high success in this department, while new varieties are constantly being produced in this country through the efforts of enterprising horticulturists of the present time. With proper care, pears may be produced in abundance by any farmer who has a suitable soil, with but little labor or expense, while they are a luxury that no family should be deprived of. Pears will not keep as long as apples, but with suitably selected varieties, and proper storage, they may be had from August until the spring following, some of the winter varieties being very delicious, with good keeping qualities.

The principal value of the pear is as a dessert fruit, although it is used for baking, stewing, drying, canning, etc., to a considerable extent. Dessert pears should have a melting, soft texture, and should be juicy, sugary, and of an aromatic flavor. Pears for baking, drying, and canning should be large in size and be more firm in texture, with crisp flesh, and moderately juicy.

Dwarfs and Standards.—Dwarf pear trees are generally produced by budding or grafting on the quince. The principal object of this is to produce trees that will bear at a much earlier age than the standard trees, the dwarf frequently producing fruit in two years after planting. Such trees are frequently very fruitful, but are not usually very long-lived. They require the same treatment as standard trees, except that they should be planted from two to four inches deeper in the soil when being transplanted than they had previously grown.

They should be set so that the junction of the pear and quince should be about four inches below the surface of the soil, and the earth pressed closely and compactly around the trunk. With this method of setting, the pear-stem will frequently send out roots and sustain the tree after the quince root is dead. In such a case the tree becomes part dwarf and part standard, and will be longer-lived than otherwise.

Many varieties of pears succeed well as dwarfs, while others do not, and should never be grown in this manner. Some varieties do even better when grown as dwarfs than as standards. In planting trees it is always well to set a few dwarfs of each variety that succeed well in this manner, in order to supply fruit while the standards of the same, which are set at the same time, are attaining a bearing age.

Some of the principal varieties that succeed well as dwarfs are the Bartlett, Beurre d'Anjou, Duchesse d'Angoulême, Flemish Beauty, Vicar of Winkfield, Clapp's Favorite, Belle Lucrative, Buffum, Howell, Louise Bonne, and Louise Bonne de Jersey.

Varieties.—The varieties of pears are very numerous, and the number is constantly increasing by the propagation of new varieties in this country, and by importations from the old world. Among the hundreds of varieties, amounting to over a thousand, that have been originated, the great difficulty seems to be to determine which are the most valuable for cul-

tivation, and which are best adapted to certain localities, since a variety may prove of superior quality in one locality, and quite the reverse in another, the difference being caused by the difference in soil and climate. There are, however, many varieties that seem to thrive well in nearly all parts of the country. Mr. Downing says with reference to this subject:

"A variety may prove of superior merit in one locality and quite indifferent in another, owing to influence of soil and climate. This, however, is true only to a very limited extent, as the fact that most sorts of the first character receive nearly the same praise in Belgium, England, and all parts of this country clearly proves. High flavor, handsome appearance, productiveness, and uniformly good flavor in all seasons—these are the criterions of the first class of pears.

Most of the finer varieties of pears have not the necessary hardiness to enable them to resist, perfectly uninjured, the violent atmospheric changes of our climate, except under favorable circumstances; consequently the fruit is more or less variable in quality; and this is more particularly true of some that come to us from abroad with promise of the highest excellence, and to pronounce an abiding judgment upon their merits requires many years' experience and careful observation under different circumstances and in various localities. And it must be borne in mind that, although young trees give fruit of nearly or quite full size and beauty, yet perfection of flavor is only to be expected from trees of more mature age. The inference is not legitimate that a variety which exhibits great excellence in Belgium, or some of the districts of France, will exhibit generally in all localities in the United States the same excellence; but the supposition is fair, and borne out by some experience, that those which possess excellence of a particular character in an eminent degree in Europe, will generally exhibit the same in particular localities in this country. We would instance such vigorous growers, with pretty solid flesh, as the following: Belle Lucrative, Rostiezer, Duchesse d'Angoulême, Beurré Hardy, etc. To produce satisfactory results in the cultivation of pears, some of their wants must always be complied with, such as good depth of soil, sufficient drainage, and proper enrichment."

In some sections certain varieties are specially subject to disease, such as blight, yellows, etc., when in other localities they may be entirely exempt from disease of every kind, the climate, soil, etc., exercising a great influence in this respect. The amateur fruit grower will therefore do well to consult the best practical fruit growers in his vicinity with reference to the best adapted varieties, before selecting his trees, as he may thereby be saved much expense, labor, and disappointment.

It will not be possible, owing to want of space, to give in this work an extended list or description of the many excellent varieties of pears cultivated in this country; we shall only give a brief list of some of the choicest kinds, such as the BARTLETT, BEURRE D' ANJOU, DUCHESSE D' ANGOULEME, FLEMISH BEAUTY, BLOODGOOD, KEIFFER'S HYBRID, CLAPP'S FAVORITE, LOUISE BONNE, HOWELL, LAWRENCE, SECKEL, VICAR OF WINKFIELD, WINTER NELIS, BUFFUM, BEURRE CLAIRGEAU, BUERRE GIFFORD, BELLE LUCRATIVE, LOUISE BONNE DE JERSEY, BEURRE BOSC, LECONTE, ETC.

Among the varieties that will endure about the coldest localities of the United States may be mentioned the Flemish Beauty, Louise Bonne de Jersey (dwarf), Beurré d'Anjou, Clapp's Favorite, Doyennè d'Ete, Duchesse, Rostiezer, Seckel, Winter Nelis, and Onondaga, while the Bartlett and Lawrence are also quite hardy and able to endure a cold climate, although not quite equal in this respect to those previously mentioned.

The Bartlett.—This is the most popular of all the summer varieties, and originated in England in 1770, and was known there as Williams' Bonchretien. When first introduced its name was lost, and having been cultivated and disseminated by Enoch Bartlett, of Dorchester, near Boston, it became known by its present name. It is considered the best of all the summer varieties. The fruit is of large size, oblong, skin thin and smooth, clear yellow,

with a soft blush on the sunny side of the fruit that is exposed to the sunlight; flesh fine-grained, sweet and juicy, vinous. Ripens from the last of August to the last of September. The flavor is injured when grown in damp or unfavorable soils, it then being somewhat acid.

Buerre d'Anjou is one of the very best varieties of pears, said to be of French origin, and was introduced into this country by Col. Marshall P. Wilder. The tree is vigorous and hardy, the fruit large, with a short thick fleshy stem, surrounded by russet. Skin of a greenish color, sprinkled with russet, and sometimes tinted with faint crimson, and thickly dotted with brown and crimson. Flesh nearly white, deliciously vinous and juicy. Ripens in October and November.

Duchesse d'Angouleme.—This is a very large variety of pear, sometimes weighing a pound and a quarter. It is said to be a natural seedling, found in the forest hedge near Angers. It is very large, oblong obovate in form, with a somewhat uneven surface. Skin greenish yellow, streaked and spotted with russet. Flesh white, very rich and juicy, and of excellent flavor. Ripens in October.

Fuller, in his Pear Culturist, relates the following bit of romance in connection with the celebrated Duchesse d'Angoulême pear: A French nobleman, observing his tenant about to destroy a fine, thrifty pear tree, inquired the cause. He was told that it was a chance seedling, and had borne no fruit in twenty years. He had already cut its roots preparatory to the first stroke, but was ordered to let it remain. He did so, and in the following year it was loaded with superb fruit of an entirely unknown variety, which at once became celebrated. The root-pruning the gardener had given it worked like a charm. Not many years afterwards, when the Duchesse d'Angoulême was passing through Lyons, its inhabitants sent to her their hospitalities. Nine fair maidens presented the Duchesse with golden salvers, on which lay heaped this precious fruit, and begged her to bestow on it her name; and the pear, now recognized as the crowning glory of all fruits, was thenceforward known as the Duchesse d'Angoulême.

Flemish Beauty.—An old variety; said to be of Belgian origin. The tree is very hardy and productive. It should be gathered sooner than most varieties, since if left upon the tree until it parts from the branch readily, it will be of poor quality and soon decay, but when ripened off the tree, very fine flavored. Fruit, large and roundish in form, skin of a pale yellow ground, but mostly covered with patches and streaks of light russet, shading to a reddish brown when matured and exposed to the sun. Stalk short; flesh yellowish white, rather coarse grained, but exceedingly juicy, fine flavored, and rich. Ripens the last of September.

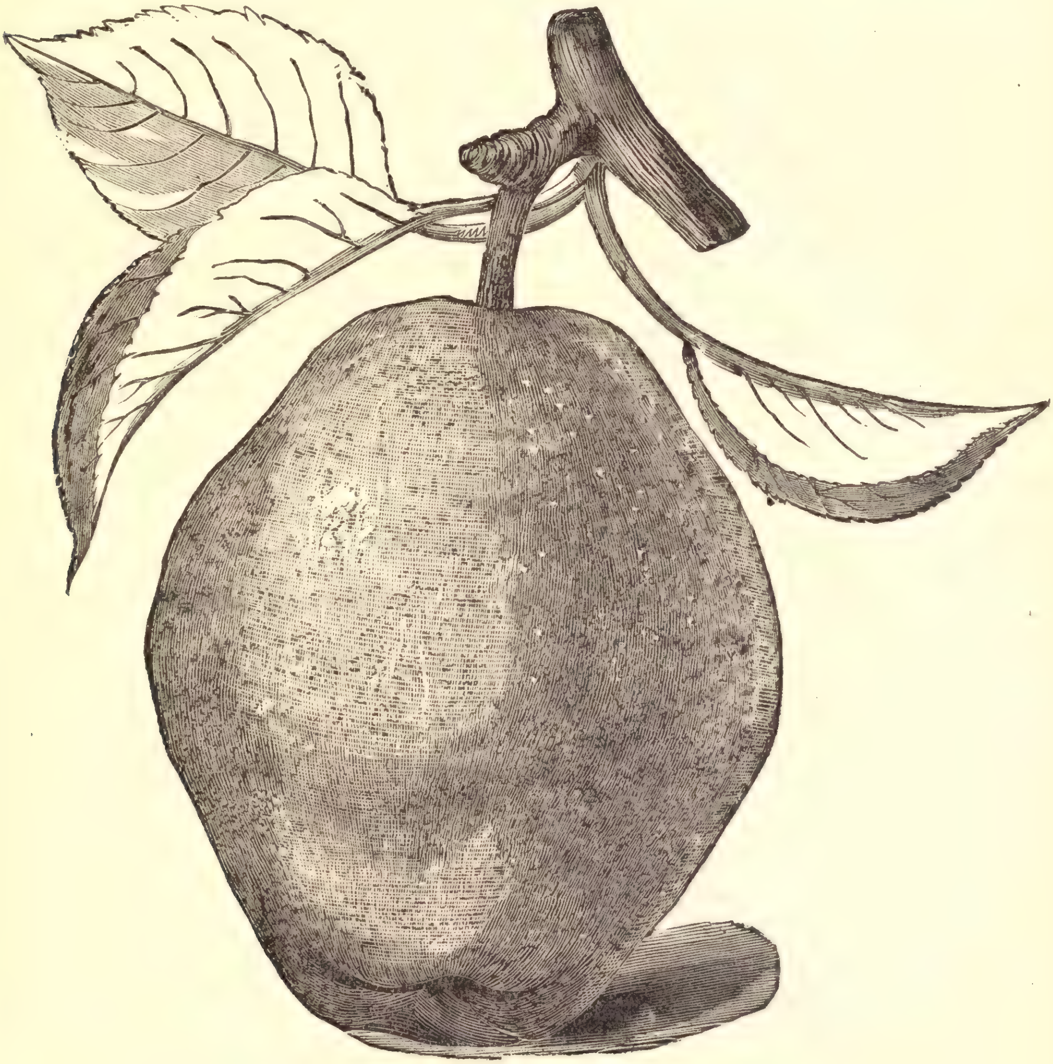
Bloodgood.—An early pear, of very high flavor, and is one of the best of early varieties. The fruit is of medium size, slightly obovate, thickening abruptly into the stem. Skin yellow sprinkled with russet, flesh yellowish white, fine grained, and melting with a rich, sugary, aromatic flavor. It ripens from the early part of July to the middle of August.

Clapp's Favorite.—This fine pear was raised from seed by Mr. Thaddeus Clapp of Dorchester, Mass. The fruit is large, obovate; surface a little uneven, skin pale yellow, faintly marked with crimson, and thickly sprinkled with russet spots, when grown in a sunny exposure. The flesh is white, fine grained, juicy, melting, sweet, vinous, and rich. Ripens the last of August and early in September.

Louise Bonne.—An old French winter variety, large, pyriform, skin smooth, pale green in color, flesh white, rather coarse grained, juicy, and sweet. A good winter variety, ripens in December.

Howell.—This valuable pear was produced by Mr. Thomas Howell of New Haven, Conn. The fruit is rather large, roundish in form, light yellow in color, with a slight blush finely shaded when exposed to the sun, thickly sprinkled with fine russet dots. Flesh somewhat white, juicy, brisk and vinous in flavor. Ripens in September and October.

Keiffer's Hybrid.—This variety was produced from the seed of the Chinese Sand pear, accidentally crossed with the Beurre d'Anjou or some other kind growing near it. The tree is a vigorous grower and prolific bearer. The fruit is of medium size, somewhat oval in form, narrowing at both ends. In color it is a deep yellow with a few patches and sprinklings of russet; flesh whitish, slightly coarse in texture, juicy, and sweet. The quality is very good, and resembles that of the Chinese Sand pear. It is best when gathered at mature growth to ripen in the house. It ripens in October and November. It is such a



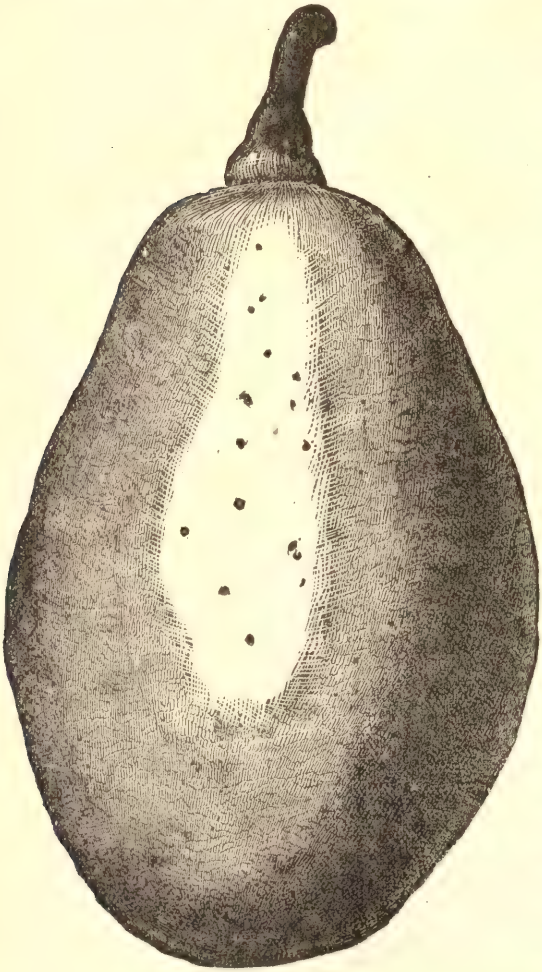
KEIFFER'S HYBRID PEAR.

prolific bearer that the fruit will be much improved by thinning after the blossoms are well set. The cut of this pear and that of the Leconte represents fruit grown by Mr. William Parry, of Cinnaminson, N. J. It is a valuable fruit, both for the table and market.

Seckel.—This is one of the best of American pears. It originated on the farm of a Mr. Seckel near Philadelphia, and is the richest, most exquisitely flavored, and sweetest variety known, it being unsurpassed in this respect by any other American or European

variety. The tree is very healthy, prolific, and hardy, and may be easily cultivated in any small garden. The fruit will increase in size if a top-dressing of manure is frequently given the roots. The fruit is quite small, obovate, and regular in form. Skin russet green, with a bright russet red cheek when exposed to the sun. Flesh yellowish white, buttery, very juicy, sweet, and melting, with rich spicy flavor. It ripens gradually from the first of September to the last of October, and should be gathered from the tree when fully grown, and ripened in the house.

Louise Bonne de Jersey.—This pear is known by various names, but more generally by the one here given. It originated in France, and is a very vigorous, productive variety. This fruit is large, oblong, a little one-sided, pale green when grown in the shade, but shaded with brownish red when exposed to the sun, and dotted with gray. Flesh greenish white, very juicy, and rich. Ripens in September and October.



LECONTE PEAR.

Leconte.—This is an old variety, originally from a cross between the Chinese Sand pear and one of our cultivated varieties. It was introduced about forty years ago by Major Leconte of Georgia. The original tree is reported to be still healthy and bearing abundantly. It is extensively grown in Georgia and other Southern States, where it is very highly esteemed. It is a large, yellow pear, of good quality, some of the specimens having been known to measure ten inches in circumference, and weigh twelve ounces. The *Southern Farmer's Monthly* says of it: "The parent tree is in Liberty County, Ga., sent there forty years ago by Major Leconte, and is the greatest bearing tree known, having borne thirty-nine bushels of pears at a single crop. It has no 'off years,' but continues to bear the same heavy crops every year; and has *no disease, blight, or insect* destroyer up to this date. The fruit of this pear is bell-shaped, of a rich, creamy yellow color when ripe, very smooth and fine-looking, and one of the best pears we have for shipping. It ripens in July, and sold in northern markets the past season for $4.50 per crate of one bushel each."

Soil and Cultivation.—Although the pear may be grown in a variety of soils and climate, it being widely cultivated in this country from Maine to Texas, as well as on the Pacific Coast, where some of the largest and most beautiful specimens are produced, yet the best results are obtained from a strong loam of moderate depth, with a dry subsoil. Pear trees should never be planted in a soil that is wet for a considerable portion of the year;

when localities having such soils are desired for planting pear trees, they should first be thoroughly underdrained. Soils that are too heavy and rich stimulate the tree to an excessively luxuriant growth, which results in the wood of the tree not becoming fully ripened, and in consequence it is liable to be winter killed by blight. On the other hand, soils that are too light require enriching by trenching or top-dressing with richer soil or suitable manure. In a cold climate pear trees should be planted on a southern slope, where they will have the benefit of the warm sunshine; but in a warm climate a cooler site should be chosen. Standard pears are generally planted about thirty feet apart, dwarfs considerably nearer according to the size they will attain when full grown. Pear trees that have arrived at a bearing age should have a top-dressing of manure applied every autumn, unless the soil is otherwise quite rich. Chip dirt of good quality, wood ashes, and iron filings are excellent for pear trees, especially the latter. It is stated by those who have tried the experiment that pear trees fertilized annually by sweepings from a smith's shop in which there are a large quantity of iron filings and small bits of iron, give a large yield of excellent fruit. Pear trees require but little pruning, in fact less than any other fruit tree.

The Proper Time to Pick Pears, Storing, etc.—Pears differ from all other kinds of fruit in respect to the time of gathering. While all others attain their highest degree of perfection in being allowed to remain on the tree until fully ripened, pears are best if picked when of mature growth, and permitted to ripen off the tree in a dark place. In fact, many of the choicest and most delicious varieties would be almost worthless if allowed to become mellow on the tree.

The following directions, from one of the best authorities on this subject, will be found of value to all who cultivate this fruit: "If taken off the trees too soon, the fruit withers before it ripens; while if left on too long, loss follows from evaporation and decay, the fruit being of an inferior quality. To avoid these evils, then, should be the aim of those fruit growers who are not already familiar with this part of the business—an important one for those who grow pears for profit. There is a change in color which takes place in pears that is a sure sign of ripeness to the experienced eye. This is always accompanied by unmistakable marks which, being consulted by the novice, there need be no loss from untimely picking. The seeds of pears always change from a light to a dark brown color when the fruit is matured, and will, when gathered and placed in a proper place, ripen without withering. Another and safe rule to follow in gathering pears is to watch for the swelling of the end of the stem attached to the twig, and, by raising the pear gently by hand, it separates without effort; while, with a green specimen, no such separation can take place unless force is used. Neither for home use, nor market, should pears be allowed to ripen on the tree, for the quality of such will always be inferior to those ripened in a dry, dark, and cool atmosphere. Pears intended for market should be hand-picked, sorted into two sizes at the time of gathering; and a stem upon each pear is an important appendage, making a difference in their favor of from 10s. to 20s. per barrel, which is the most convincing argument. In practice, it seldom happens that all the fruit on a tree is fit to gather at the same time. Going over the trees two or three times in a period of the same number of weeks, taking off each time the fruit far enough advanced, will be found the best practice to follow. In picking, sorting, and packing, avoid rough usage, for whenever pears are bruised, they rot before ripening, and of course such blemishes will tell against the fruit. Delicate and thin-skinned sorts are more easily injured by rough handling than varieties with tough skins, like Duchesse d'Angoulême, Beurré Bosc, and Lawrence; but, whether tough or tender, rough handling should be avoided. Pick pears only on dry days, and under no circumstances is it best to pack such fruit for market until it has cooled off, which it will in a few hours, if placed in a dry, cool atmosphere, to which darkness should be added if the fruit is kept in bulk for any length of time after picking. Where the latter is the case, it is well to turn the heap over by hand, say

once in ten days, taking out bruised or decaying specimens. No vegetables should be stored in the same room with pears, for the latter are sure to acquire the flavor of the former."

Where pears are cultivated in abundance on a farm, a fruit room devoted to the purpose of ripening the fruit will be almost a necessity, so important is the ripening of it off the trees in a dark, dry place. Such rooms require to be filled up with shelves in tiers, upon which the pears are laid; also to be kept dry and at a cool temperature. When such a room is not at command, shallow drawers may be used for storing the pears for ripening, putting in the bottom of each drawer a cloth or paper, then a layer of pears and a layer of cloth, thus keeping the pears from touching each other. Woolen cloth is the best for this purpose. Winter pears should be allowed to hang on the tree as long as possible, in order that the fruit may be perfectly mature, or until the nights become frosty. Such fruit will bear more cold than grapes or apples, but should never be exposed to a severe frost. Pears should always be gathered in dry weather. Each specimen of fruit should be wrapped in paper, be packed in kegs, barrels, or boxes, and put in a cool, dry room, but should not, however, be exposed to frost. About two weeks before the time of using, winter pears should be brought into a warmer room, as this will cause them to become mellow and juicy, and less tough than if ripened entirely in a cold room.

Improving the Color of Pears.—All fruit will be more highly colored when grown in a sunny exposure, and pears are no exception to this rule. The color of many varieties of pears may, however, be greatly improved by placing layers of the fruit between woolen blankets and allowing it to be packed in this manner for a few days. Fruit to be marketed will frequently bring a much higher price when of a rich color than otherwise.

Retarding the Time of Ripening Pears.—Many varieties of pears will command a much higher price in market if the ripening process is delayed from four to six weeks. This can be easily accomplished by placing the fruit in clean boxes, crates, or barrels, directly upon ice in an ice house, and covering the boxes or crates fully a foot deep with sawdust. The fruit should be treated in this manner when quite hard, and before it has commenced ripening. Removing to a warmer temperature would be necessary, in order to complete the ripening process. Fruit of all kinds, even when fully ripe, will keep much longer by placing whatever contains it upon ice. Pears should never be allowed to freeze, nor be placed in too warm a room.

Yield of Pears, Marketing, etc.—Most varieties of pears are usually good bearers; the yield will of course be according to the variety and the size of the tree, the dwarf trees yielding considerably less than the standards. Consequently the yield of a single tree may be from a bushel up to two or three bushels or more. In some orchards the fruit product will average a half barrel to a tree, in others a barrel or more. Good fruit will always command a good price, and it will pay to raise no other. Some fruit growers who supply the market state that from a number of dwarf pear orchards of choice varieties that have been planted from five to twelve years, they have known the fruit to bring some years from $500 to $1,500 per acre; and from standard trees to from $400 to $1,000 per acre, although $200 per acre is the more usual price. Pears grown on dwarf trees are frequently extra large in size, and in consequence being an extra high price in market.

In marketing pears they should always be securely packed in boxes, crates, or barrels, in order to prevent them from shaking about and becoming bruised in transportation. They are usually shipped when partially ripened, or rather green, according to the distance of transit. The finest colored specimens will bring the best prices if first wrapped when partially ripened in clean paper, and placed in small packages, such as boxes, crates, or flat market baskets.

Diseases of the Pear. — The principal disease of this delicious fruit, and one which is a serious drawback to its cultivation in many sections, is what is commonly termed *the pear blight.* This is supposed to be of two kinds, or rather is produced by two distinct causes, viz.: the INSECT BLIGHT, and the FROZEN SAP BLIGHT. There is also a slug worm that in many localities does great damage to pear trees from the middle of June to the middle of July. Aside from these, the other diseases incident to pear trees are mainly such as are known to the apple tree. For treatment, see DISEASES AND ENEMIES OF FRUIT.

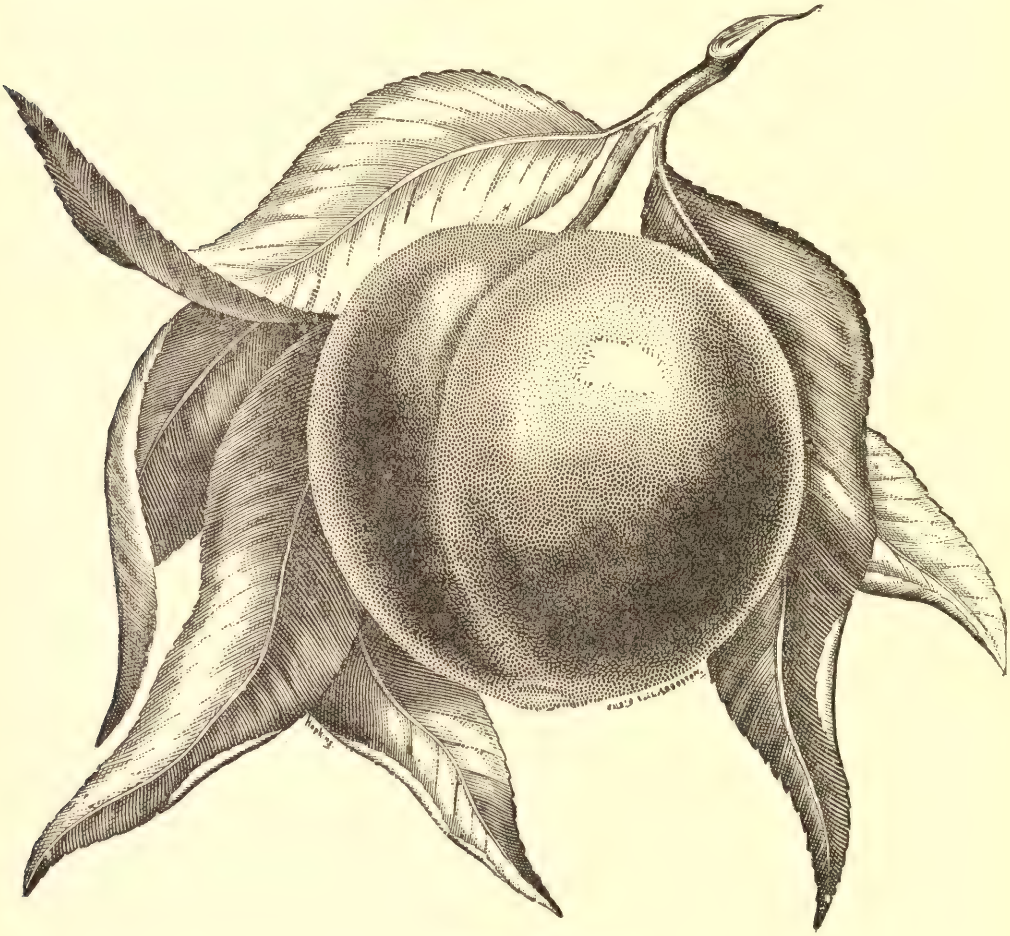
Peaches. — Formerly peaches were grown in nearly all parts of this country, even as far north as the State of Maine; but the removal of the forests has caused such climatic changes and increased the exposure of the trees to the cold winds and severity of winter to such an extent that now, even in central New England, it is very difficult to raise this most luscious of fruits. The peach is a native of Persia and China, and is supposed to have been brought to Italy by the Romans in the time of the Emperor Claudius. It was introduced into this country by the early settlers about the year 1680. It is easily cultivated in sections adapted to its growth, which is nearly all parts of the country, and often succeeds finely in mountainous regions, where it would seem almost impossible to produce it. In the Middle, Southern, and most of the Western States peaches are extensively cultivated, many fruit growers having orchards of from five thousand to a hundred thousand trees of different ages. The peach is short lived; consequently frequent planting of trees is a necessity.

Varieties. — The varieties of the peach are exceedingly numerous, new seedlings being constantly produced. to be soon succeeded by others. A few of the old standard sorts remain as good as when they were first introduced, some of which are commonly known in all sections where the peach is grown; but, as a rule, we find the varieties of the peach more transient, and also of a more local nature than almost any other kind of fruit. A few of the best varieties suited to the soil and climate are better for setting an orchard than to attempt the culture of a large number of sorts, the merits of which may not be well established. Like all other kinds of fruit, certain varieties thrive best in certain soils and sections. Among the numerous kinds in cultivation, the following may be regarded as among the best: For the Northern States — the WATERLOO, RED RARERIPE, YELLOW RARERIPE, EARLY BEATRICE, EARLY YORK, EARLY TROTH, TILLOTSON, OLD MIXON FREE, CRAWFORD'S EARLY, WILDER, PRATT'S RARERIPE, the latter a variety recently introduced by Jas. H. Dwelly, of South Hanover, Mass. The earliest varieties of peaches will generally be found most desirable for New England and the North generally, as the latest ones rarely mature well. For the Middle States — OLD MIXON FREE, OLD MIXON CLING, GEORGE THE FOURTH, RED RARERIPE, ALEXANDER, SUPERB, MORRIS WHITE, COWPER'S MONMOUTH, SUSQUEHANNA, VAN ZANT'S SUPERB, CRAWFORD'S LATE, SURPASSE, CHINESE CLING, etc., together with many of the above-mentioned hardy varieties. The kinds adapted to the South include about all those previously mentioned, and the varieties of China peaches, which meet with satisfactory results; also the LA GRANGE, GOVERNOR, THURBER, LATE RARERIPE, etc. In Florida and some other parts of the South, peaches bear well in two years from the seed, the early kinds ripening in May and June.

Propagation. — The peach is more easily propagated than any other fruit, arriving quickly to a bearing age. When left to itself, a peach after being planted will produce a tree that will come into bearing the third or fourth year in the cooler climate; but a stone planted in the autumn will grow during the ensuing spring and summer to the height of three or four feet, and may be budded in the following August or September. In two years from this time it will generally produce a small crop of fruit, and the following year will bear an abundant crop, unless the soil is excessively rich, producing an over luxuriant growth of branches. The following spring (in March), after budding the peach, the stock should be headed or cut back,

which will cause it to put out vigorous branches. Budding is generally practiced at the North with peach trees, but grafting is frequently resorted to at the South. Planting upon the site of an old peach orchard or tree is not to be recommended, as such soils are more or less exhausted of the elements requisite to their successful and healthy growth.

Cultivation. — The best soil for the peach, is a rich, deep, sandy loam, although it will thrive well on various other kinds of soils, such as the light, sandy soil of Delaware and New Jersey. The site chosen for a peach orchard will depend upon the latitude. In sections of the country where the fruit buds are liable to be cut off by the early frosts, it has been



PRATT'S RARERIPE.

found that it is better to plant peach trees on the slopes of hills with a northern and western exposure in order to avoid the early starting of the fruit buds, which endangers their being blighted by frosts. By this means the colder exposure retards the putting forth of the buds and blossoms until after all danger of frost is passed. Evergreen trees thickly planted on the north and west sides of a peach orchard will aid materially in breaking the force of the strong winds from those sources.

With respect to the culture of peach orchards, there seems to exist a difference of opinion, which is very properly based upon the nature of the soil, as will be seen by the following from the pen of Mr. Downing: "Most of the cultivators at the South say, *never plow*

or cultivate an orchard after it has borne the first crop. Plowing bruises the roots, enfeebles the trees, and lessens the crop. Enrich the ground by top-dressings, and leave it in a state of rest. The best northern growers say, always keep the ground in good condition, mellow and loose by cultivation, and crop it very frequently with the *lighter* root and field crops. Both are correct, and it is not difficult to explain the seeming difference of opinion.

The majority of the peach orchards south of Philadelphia, it will be recollected, grow upon a thin, light soil, previously rather impoverished. In such soils it is necessarily the case that the roots lie near the surface, and most of the food derived by them is from what is applied to the surface or added to the soil. Plowing, therefore, in such soils, wounds and injures the roots, and cropping the ground takes from it the scanty food annually applied or already in the soil, which is not more than sufficient for the orchard alone. In a stronger and deeper soil the roots of the peach tree penetrate farther, and are mostly out of the reach of serious injury by the plow. Instead of losing by being opened and exposed to the air, the heavier soil gains greatly in value by the very act of rendering it more friable, while at the same time it has naturally sufficient heart to bear judicious cropping with advantage rather than injury to the trees. The growth and luxuriance of an orchard in strong land, kept under tillage, is surprisingly greater than the same allowed to remain in sod. The difference in treatment, therefore, should always adapt itself to the nature of the soil. In ordinary cases, the duration of peach orchards in the light, sandy soil is rarely more than three years in a bearing state. In a stronger soil, with proper attention to the shortening system of pruning, it may be prolonged to twenty or more years."

Peaches should be planted each year, so as to have a succession of young and vigorous trees to take the place of the old ones as they die, or become unfruitful.

Pruning the Peach.—It has been found that peach trees thrive the best, and will produce the most satisfactory results when well pruned each year, the pruning being done very early in the season, before the buds begin to swell. The method of pruning recommended by the most successful fruit growers of the country, is to cut off half of the previous year's growth, called "*shortening in*," this to be done over the entire outside branches as well as the inner ones. By this means, the young wood, which is that which produces the fruit, is reduced one-half, and the other half left upon the tree receives all the sustenance from the sap, causing the branches to increase in size rapidly, and send out vigorous, thrifty shoots for the next year's bearing. Besides, the other advantages gained are a better-shaped, thickly-branched tree, that is more hardy and vigorous, better able to withstand the severity of the winter; hence, longer lived and more productive, while the fruit is more easily gathered, and the branches are not as liable to be broken down by the winds or the weight of the fruit. Such pruning requires considerable labor and time, where there are large orchards, but it well repays in the result; besides, this labor is not so great an objection, since it comes early in the season when other farm work is not pressing.

The editor of the *Fruit Recorder* thus gives his experience with the different methods of pruning, and the result in favor of that above advocated: "We have planted out and grown thousands of peach trees within the past twenty years, and have now growing on our grounds at Palmyra, fully five thousand trees of different ages, and from our experience, we are confident that to have long lived and productive trees, this shortening in process must be attended to timely and regularly. The fruit orchard we set first, of 1,800 trees, we trimmed up the limbs from the body and thinned out the tops, following this up from four to six years, and the result was that these trees grew up tall and spindling—the fruit and heavy winds, with snow and sleet, breaking them down and ruining the trees.

The next orchard we set, we took one-year old trees and cut them right back to within one to two feet of the roots—owing to size. These made a low, stocky head the first season, and these heads we shaped by cutting back half to two-thirds the main branches of that sea-

son's growth. The result is, we have strong stocky trees now — that do not break down with their load of fruit, while the winds do nct have such disastrous effect in blowing off the fruit."

Peaches should be gathered with great care to prevent bruising, as they decay very rapidly from such causes.

Yield, Marketing, etc. — Peach trees produce from a half bushel to six bushels or more of fruit each, according to the size of the tree, and the care given. They are generally shipped in bushel crates, or peach baskets holding about half a bushel each, the price ranging according to the season, the supply of fruit, and the quality. Some of the finest peaches are grown on elevated land within a mile or two of large bodies of water. The sale of peaches will range according to the season, etc., from $100 to $600 per acre. When desired, they can be kept from two to four weeks longer than otherwise, by putting the crates on ice in the ice-house and covering with blankets, or other material. In packing for market, the fruit should be put in very compact, in order to prevent shaking about and bruising.

Diseases and Enemies of the Peach. — Great detriment to peach culture has been found in the *peach-borer* or *peach-worm*, which bores into the bark of the tree below the ground, frequently entirely girdling it; also the disease known as the *yellows* and the *curl*. In the former the principal characteristic is that of the leaves turning yellow, or being nearly destitute of color, the leaves curl and finally drop from the tree. For treatment, see DISEASES AND ENEMIES OF FRUIT.

Nectarines. — The nectarine is a species of peach, having a smooth skin. The tree resembles that of the peach in general appearance and can scarcely be distinguished from it. The fruit is considerably smaller than the peach, however, without down, and very wax-like in appearance; in flavor it somewhat resembles the peach, although not quite as juicy. Nectarines are so closely allied to the peach, that both peaches and nectarines have been known to grow upon the same branch, and nectarines when planted have been known to produce peaches, and the reverse. The variety known as the Boston Nectarine is said to have originated from a peach stone. This fruit does not seem to be quite as hardy and productive in this country as the peach, although it differs in this respect in different localities.

Varieties. — The principal varieties of the nectarine are the BOSTON, a fine seedling raised from a peach stone by Mr. T. Lewis, of Boston; the ALBERT, one of the finest varieties, but requiring a warm location and soil to ripen well; the DOWNTON, a large variety of very good quality; the EARLY NEWINGTON, early, and one of the finest of the clingstone nectarines; EARLY VIOLET, considered by many the *best* of all varieties. It is of French origin, very hardy and productive. It is large in size, has a delicious flavor, red flesh, and dark colored stone. Skin pale, yellowish-green, and when exposed to the sun, is mottled with dark purplish dots. The ELRUGE, a choice English variety much resembling the Early Violet; HARDWICK'S SEEDLING, a choice variety and very hardy and productive; HUNT'S TAWNY, an early, prolific variety, very hardy; PITMANSTON'S ORANGE, considered one of the best of the yellow-fleshed varieties; STANWICK, a white-fleshed, later variety of fine quality; ROMAN, a very old kind, of excellent flavor, and the NEW WHITE, a fine, light-skinned fruit of more than average quality. Among the best and hardiest nectarines for northern latitudes may be mentioned the Violet Hative or Early Violet, Elruge, Hardwick's Seedling, Hunt's Tawny, Boston, Roman, and New White.

Cultivation, Pruning, etc.—The cultivation, pruning, etc., of the nectarine is precisely like that of the peach. It will grow wherever the peach thrives, yet it will not produce large, fine fruit unless pruned annually according to directions given for peach culture. The *curculio* has thus far been the greatest obstacle encountered in the cultivation of nectarines in this country.

Plums.—The origin of most of the cultivated varieties of the plum may be traced to Southern Asia, or the southern portion of Europe, although there are three or more species of the wild plum in this country; these are, however, very rarely grown in gardens, since the cultivated varieties are so greatly superior to them in quality. Plums are delicious fruit, and if the curculio,—the enemy most destructive to this fruit,—can be kept at bay, they may be easily raised in great abundance, since the tree is naturally hardy, a vigorous grower, and very productive.

Varieties.—There are a large number of varieties of the plum, and additions to the list are frequently being made by seedlings raised in this country. Still we know of nothing better than one of the old and well known varieties, the GREEN GAGE, although there are others that approximate near to it in quality. Other fine varieties are the IMPERIAL GAGE, PURPLE FAVORITE, WASHINGTON, COE'S GOLDEN DROP, JEFFERSON, MADISON, LOMBARD, RICHLAND, REINE CLAUDE DE BAVAY, and SMITH'S ORLEANS. The first mentioned may be regarded as of the best quality; the Washington, Jefferson, Madison, and Imperial Gage are among the largest and most beautiful of plums, while Coe's Golden Drop, and Reine Claude de Bavay are fine late maturing varieties.

Cultivation, etc.—Plums are commonly propagated by sowing the seeds of almost any thrifty growing variety, and the trees budded when about two years old with a choice variety desired for propagation. Like the peach, and other similar fruit, the stones should be planted in the autumn. The soil best adapted to the plum is a heavy loam, or soils in which there is a considerable amount of clay. It will, however, grow vigorously in almost any section of the country, but fruit of the best and finest flavor is produced on soils of the above mentioned quality. Sandy soils are most liable to trouble with the curculio than others, although none are entirely exempt. Common salt has been found one of the best fertilizers for this fruit, to be applied as a top-dressing about the roots. The plum thrives best when shallow cultivation is given the soil; in fact, it cannot give the best results possible to be obtained, in turf ground. But littlep runing is required, except thinning out and taking away decayed branches. Old trees may be rejuvenated in a measure by heading them in rather closely, and applying a good top-dressing of salt, wood ashes, and other fertilizers to the roots.

Diseases and Insects of the Plum.—There are but two serious obstacles in the successful culture of the plum in this country, and these are the curculio or plum weevil, and the black knot. For description and treatment, see DISEASES AND ENEMIES OF FRUIT.

Apricots.—A native of Arabia, and the higher regions of Central Asia, the apricot requires a rather warm climate, and a rich, dry soil, to attain its highest degree of excellence. It is, however, grown quite successfully in some sections of the North, but thrives best in the Southern Middle, and Southern States. It belongs to the plum species, and is a very handsome and delicious fruit, ripening shortly after cherries, and before plums.

Varieties.—There are fewer varieties of the apricot than of most cultivated fruits. The BREDA is one of the hardiest trees for general culture, and the fruit, though small, is highly flavored and rich, making a fine dessert dish. The MOORPARK is one of the most popular and widely disseminated varieties in this country. The HEMSKIRKE, a large, beautiful English variety, is juicy, and of a rich, plum-like flavor; other varieties that might be numbered among the best are the LARGE EARLY, ROYAL, TURKEY, EARLY GOLDEN, and PEACH.

Cultivation.—The apricot requires a deep, dry soil of a rich quality. It grows very rapidly, and requires considerable pruning. When budded upon the plum the tree is more hardy and long lived than when budded upon the peach. In general management and

pruning, the same treatment should be given as to the peach, since it is only by careful, thorough pruning that it can be kept productive for a long time. The curculio or plum weevil is the most troublesome of all insects in the growing of this fruit.

Cherries.—The cherry is a native of Asia, and from thence was disseminated through all parts of Europe. It has been cultivated for fully two thousand years. It thrives well in all sections of the country, except the extreme North and South, and even there a few of the hardiest varieties may be grown. It furnishes an excellent shade, and is a very ornamental tree.

Mr. Loudon gives the following account of the use made of cherry trees in Germany and Switzerland. It is, indeed, a beautiful custom to be imitated by the government of any country,—that of planting fruit trees by the roadside for shade and refreshment to the traveler: "On the Continent, and more especially in Germany and Switzerland, the cherry is much used as a roadside tree; particularly in the northern parts of Germany, where the apple and pear will not thrive. In some countries the road passes for many miles together through an avenue of cherry trees. In Moravia, the road from Brunn to Olmutz passes through such an avenue, extending upwards of sixty miles in length; and in the autumn we traveled for several days through almost one continuous avenue of cherry trees, from Strasburgh by a circuitous route to Munich. These avenues, in Germany, are planted by the desire of the respective governments, not only for shading the traveler, but in order that the poor pedestrian may obtain refreshment on his journey.

All persons are allowed to partake of the cherries, on condition of not injuring the trees; but the main crop of the cherries, when ripe, is gathered by the respective proprietors of the land on which it grows; and when these are anxious to preserve the fruit of any particular tree, it is, as it were, tabooed; that is, a wisp of straw is tied in a conspicuous part to one of the branches. When the grapes are ripe in France, vines by the roadsides are protected by sprinkling a plant here and there with a mixture of lime and water, which marks the leaves with conspicuous white blotches. Every one who has traveled on the Continent in the fruit season, must have observed the respect that is paid to these appropriating marks; and there is something highly gratifying in this, and in the humane feeling displayed by the princes of the countries in causing the trees to be planted. It would indeed be lamentable if kind treatment did not produce a corresponding return."

Varieties.—The cherry embraces a large number of varieties, while new ones are being frequently introduced. Among the best ones for general culture are the Belle d'Orleans, Belle de Choisy, Black Tartarean, English Morello, Early Purple Guigne, Coe's Transparent, Governor Wood, May Duke, Black Earle, Early Richmond, Napoleon Bigareau, and Yellow Spanish. Varieties bearing heart-shaped fruit are the best for shade, and generally the most prolific. The Duke and Morello are the most hardy for very cold climates.

Cultivation, etc.—The cherry requires a dry soil, and will not thrive well in one that is saturated with moisture. It succeeds best in a good sandy or gravelly loam, although it is a hardy tree, and will do well in a great variety of soils. It is propagated similar to the plum, apricot, and peach and requires but little cultivation, and no pruning, except when it is desired to remove a dead branch, or to prevent the branches from crowding. Pruning is apt to cause the gum to exude, and this produces decay of the wood, hence pruning should be avoided except when necessary. With young trees, pinching in of the branches in summer for a few years is practiced by many fruit growers. The cherry is not generally a very long lived tree, but in a favorable soil and climate it frequently lives from thirty to forty years. Mulching for the first season after planting is to be highly recommended, while root pruning in mature or old trees will frequently induce fruitfulness. Old trees may also be kept fruitful and vigorous by a top-dressing of manure.

Diseases.—The cherry tree is not troubled to any serious extent with insects, and has but few diseases. On soils where the bark of the trees split open, it is better to have the lowest branches low on the trunk, or within three or four feet of the ground.

To Prevent Birds from Robbing Cherry Trees.—The best method of preventing birds from helping themselves too liberally to cherries is to encourage the king-bird to build her nest near the trees. It has been found that if tempted by scraps of cotton, strings, or small shreds of other loose material for building a nest,—these to be left in the vicinity in which it is desired to have the nest located,—the king-bird will soon accustom itself to building in and about the orchards, gardens, and even buildings of the farm.

Professor W. A. Stearns of Amherst, Mass., gives his experience in this connection as follows: "It is well known that the king bird, the most fearless fighter of the feathered tribe, attacking with violence crows, hawks, and, in fact, any bird that interferes or intrudes in the domestic arrangements of its helpmate, is particularly active in preservation of self and family during the season of nidification and incubation. Several years ago I found that one of these birds built its nest and raised its family in the corner of an eave-spout at the front end of our house. Not five rods from this place stood a cherry tree, of the variety called the ox-heart. Here for years we had struggled to see who would get a taste of this most delicious fruit. For an equal amount of time it had been 'nip and tuck,' so to speak, between the birds and ourselves. We had tried red flags in the tree, and the birds minded them not a straw; we had put scarecrows and old hats in among the branches, and the birds lighted upon them, and mocked at our efforts; we had tried shooting, and though a few birds were killed, ten came to the funeral of each, and many of the fine limbs of the tree were so riddled with shot that they died during the following autumn and spring. What to do we did not know.

In our dilemma we suddenly, one season, found the tree clear of robbers, and in surprise and delighted wonderment we feasted off the delicious fruit the whole of that season. The next season was the same. No apparent cause could be ascertained for this reign of quiet for a considerable while. It was at last discovered that while our friend the king-bird continued its nest in the eave-spout, no other bird was allowed nearer than a radius of some twenty or more rods of the tree. This took in another similar tree upon the opposite side of the walk. Thus had been raised to us a natural protector of our fruit. We cultivated the acquaintance of our favorite, threw cotton and pieces of string where he would find them, and were delighted to find that he took kindly to our suggestions and appeared to become domesticated. Finally, one year, lately, he disappeared, whether killed or not by some mischievous boy or unscientific sportsman, I do not know. To our disappointment the birds returned, and our cherries were eaten up."

Old seines or fish nets spread over the tree will prove a good protection; also small pieces of bright tin, or looking glass tied to a string two or three feet long, and fastened to the end of a pole, which is securely placed so as to sway in the wind above the branches and reflect the sunlight, will frequently frighten the birds away. Fine thread wound around the tree so as to be distinctly seen will also answer the same purpose at times, but the means that prove successful during one season will not always the next, and for this reason the king-bird, as previously stated, is the most sure prevention that can be recommended.

Quinces.—The cultivation of the quince is more limited in the United States than it ought to be, for it is a very valuable fruit, easily reared, and commands a high price in the market. The fruit resembles the orange in external appearance more than any other, while the tree grows more like a stout shrub than a tree. Its large blossoms of white and delicate pink are quite ornamental during the blossoming season, and its golden fruit is no less so when fully ripe. Its principal use is for preserving, it being one of the most delicious fruits

for this purpose, while its piquant flavor is readily communicated to other fruits, such as apples, when cooked with it. It is also excellent for household purposes when dried. With proper care and suitable soil, the quince may be easily cultivated in all parts of the country, and there is no fruit that can be more profitably grown in sections to which it is adapted.

Varieties.—The ORANGE is the most popular variety of quince, and may be called the very best of all, the fruit being large, round, fine-grained, excellent flavored, and—when cooked—very tender. The ANGERS is a hardy, productive variety, of good quality. The CHAMPION is a recent variety, now quite popular. It was found growing in a garden in Danbury, Conn., and has since been widely disseminated. It is much larger than the Orange, quite hardy and productive, but the fruit is coarse-grained and less delicate in flavor than the latter. REA'S MAMMOTH is also a large new variety of promise. When we consider the value of the quince, whether for home use or market, it is surprising that so little has been done during the last half century to improve it.

Collecting, Gathering, etc.—The quince may be propagated from layers, cuttings, grafting, budding, and the seed, but more commonly from layers or cuttings, since when produced from seed it is more liable to vary in form and quality. The following directions from a successful grower of this fruit in Northern Connecticut will furnish excellent suggestions relative to its culture: "It is true quinces have not of late years been cultivated as much as formerly, or as much as would have proved profitable to the cultivators. Many of those who have attempted quince culture have failed to bestow the necessary care, and in fact have planted the bushes in out-of-the-way and unfavorable places. Above all others we should recommend the Orange variety. If set from eight to ten feet apart, quince bushes will soon cover the ground so as to keep down the weeds and render the labor of cultivation light.

Until they do cover the ground, they should be well taken care of, and this the borers will compel if one expects to obtain fruit. These insect pests should be hunted out and destroyed the same as they are from apple trees. It is a very good plan to apply a bushel or two of coal ashes in the fall to form a mound around the trunk, and then spread the ashes out late in the spring. Quinces are easily propagated by cuttings which are usually taken off in spring early, from wood of last year's growth, and about one-fourth in length. The buds should all be cut out except the two upper ones, and the cuttings set erect about ten inches deep in rich, moist, sandy soil. If the ground is available where moisture can be assured in summer without a surplus of water in winter, or which can be disposed of by draining, it is the most desirable location for quinces. The month of September is the best time for making and putting in the cuttings. Small beds may be made well shaded from noonday sun, and watered during the summer season.

Quinces can also be propagated by layers, which are made in the spring by bending down and pegging. They usually form roots the first season, and will answer the following spring to be cut from the parent plant and transplanted into nursery rows. If raised from the seed quinces can be budded or grafted the same as the apple or the pear. The soil for successful growth should be rich and not less than two feet deep, and kept free from grass and weeds. Barnyard manure well rotted and spaded in, will not only improve the quantity, but also the quality of quinces. New plantations, if to be made in old, worn-out soils, should first have a liberal dressing of virgin earth composted with leaf mold from the woods. A free use of liquid manures, applied during winter and spring, has a decidedly beneficial effect upon the quantity and character of the fruit. Peat muck is often applied with good effect, composted with wood ashes.

A shaded situation, so often advised, should be avoided, since the quince requires as much sunshine as any other fruit. Fall is the best time for transplanting the quince, though

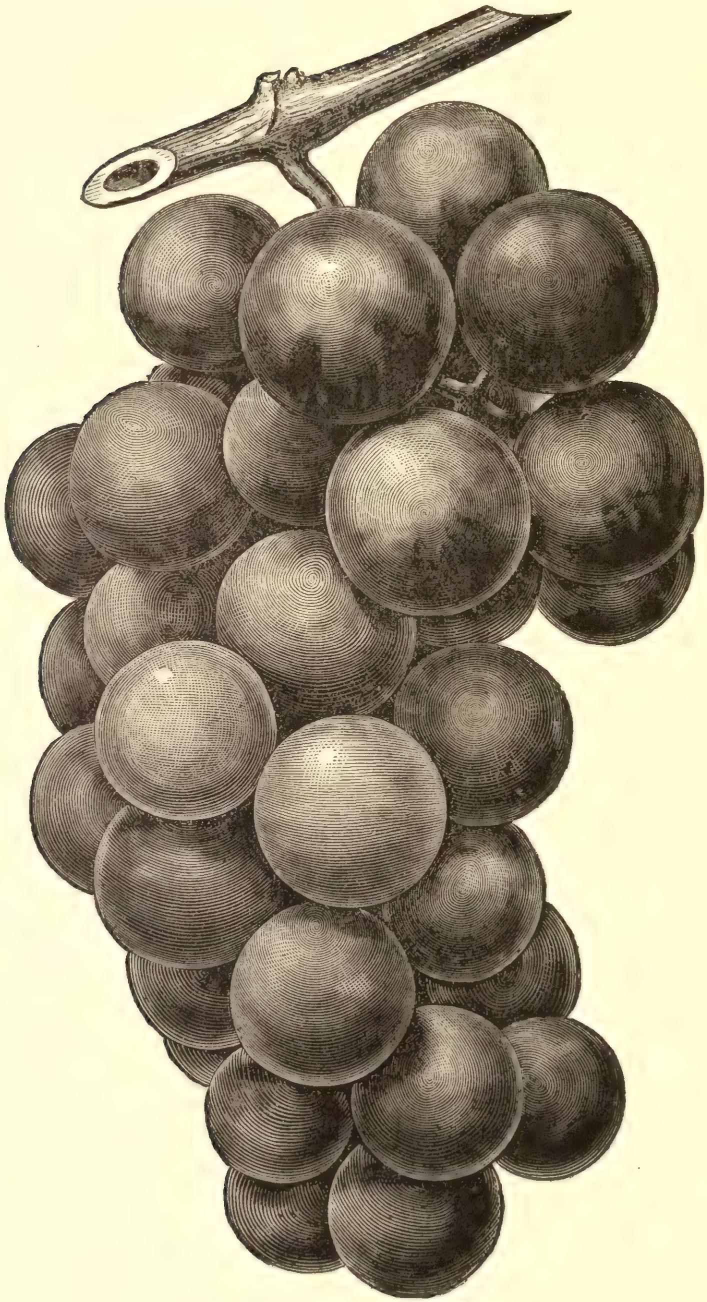
this can be successfully performed in the spring, and sometimes when well advanced, as it is a hardy plant and its roots strike very readily. It is always best to head back freely when transplanting. No fruit is more easily injured in its appearance by careless harvesting than the quince. Every bruise on its skin is followed by discoloration and decay, and consequently such specimens have poor sale in the market. Pick by hand, lay gently in the basket, and remove as carefully into barrels, treating the quince the same as the apple in handling and transporting."

Some plant the quince cuttings from five to six feet apart. Salt is an excellent fertilizer for quince trees, and if applied broadcast annually at the rate of five bushels per acre on poor soils, or ten bushels on rich soils, it will greatly promote their fruitfulness. This amount of salt would injure many fruit trees or plants, but will prove beneficial to quinces. Mr. P. M. Augur, pomologist, says: "Fertilizers suited to the pear will answer for the quince. For the last four or five years I have applied my refuse brine to my quince bushes, resulting in vigorous growth and abundant fruitfulness. I pour it in early spring, as soon as the frost is out of the ground, a few feet from the bushes, about six quarts to each plant."

Diseases.—The borer frequently attacks the quince, the same as the apple, but this fruit is subject to but few diseases, or other insect enemies. A peculiar disease similar to the smut in grain has recently made its appearance on the quince in some sections, and is supposed by many to be propagated by spores in the same manner, although not well understood. Apply salt and wood ashes for a top dressing about the roots in the spring, and whenever the disease makes its appearance, cut off all the young fruit or small branches affected as soon as possible and burn them.

Grapes.—Grape culture was practiced in the earliest period of the world's history, and may be said to be coeval with the history of man. It grows in Syria and Persia in the highest perfection, and was carried from thence to Egypt, and from there to Greece and Sicily, making its way gradually to Italy, Spain, France, and Great Britain, it being carried by the Romans to the latter country about two hundred years after Christ. The seeds of the European varieties were brought to this country by the early settlers. There are several species of the wild grape in this country which are distinct from the wine grape of Europe, and from which many of our present valuable varieties have been produced. These wild grapes are generally stronger in their growth, with larger and more entire foliage than the European varieties, and in their native state have a peculiar sharp flavor with more or less hardness of pulp. Grape culture has developed wonderfully in the United States during the last quarter of a century, and is still rapidly increasing, the grape being one of our most valuable and delicious fruits. In fact it is hardly surpassed in aroma, flavor, and beauty, by any other fruit. It is also very nutritious and healthful. Mr. Wilder says with reference to grapes:

"No other fruit, unless it be the strawberry, now attracting so much attention, and perhaps no other, if we except the apple, is of more importance as a source of revenue, or an article of luxury for our tables than the grape. No other country possesses such a vast extent of territory, or possibilities for its successful culture, and in no other section of the globe is there, at the present time, such encouragement thereto. In fact, it seems as though Providence had designed many parts of our continent especially for its cultivation. The Scandinavians—as the Sagas have it—eight hundred years ago, here found the vine growing so abundantly that they gave to our coast the name of Vineland. Champlain, in his voyages on our coast about five hundred years afterwards, saw vines in abundance. The pilgrim fathers, at Plymouth, found grapes, "white and red, and very strong," and should the phylloxera continue its devastation in the vineyards of the old world, our country may become the most favored vineland of the world.



MOORE'S EARLY.

In the whole circle of our pomological progress there is no fruit which excites so much enterprise and interest, so rapidly being extended, or which gives greater promise of success than the culture of the grape, and should this same enterprise continue for fifty years to come, we can hardly estimate its value as a revenue in our country. All localities are not equally suited to its growth, but where our wild species are found, other new and improved sorts, produced by hybridization, will be found equally well adapted. With every succeeding year new and valuable varieties are coming to notice, either adapted to special locations or purposes, or for general cultivation. Nor is it too much to hope that ere the close of this century, with our present zeal and skill, we shall produce varieties that will rival the choicest kinds of the most favored climes. Even now we have those which compare favorably with our foreign varieties, and we believe the time is not distant when the aroma of our native sorts, now so much despised by some, will become, when chastened down as it has been in the Brighton, Duchess, Rochester, and Monroe, one of the excellent characteristics of our American grapes.

How potent the influences of this art! Little did Mr. Bull think what a blessing he was conferring on the world when he sowed the seed which produced the Concord grape,—the mother of so many improved varieties. See the number of white varieties (not to speak of others) which have been produced mostly from this: the Martha, Lady Pocklington, Lady Washington, Hayes, Ann Arbor, Prentiss, Duchess, and others soon to be within our reach.

The illustrations of this improvement are manifested in the numerous seedlings obtained by crosses on the Concord, some of which are of a very remarkable character, possessing great size and beauty, and whose vigor and productiveness are declared to be even greater than that of their mother. We see this improvement also in the crosses of a wild grape with the foreign species by Rogers, as shown by the amelioration of the native aroma in the Barry, Wilder, and Lindley, the last named, like the Jefferson of Ricketts, possessing a peculiar rich flavor which might, with propriety, be denominated and may yet be distinguished as the Muscat of America.

Nor do I doubt that we shall in time produce varieties which will compare favorably with, and perhaps be equal in size, beauty, and excellence to the Cannon Hall, or other Muscat, now so highly praised for their peculiar aroma. The Pocklington, in size and beauty, is an approach to this. Nor is it unreasonable to suppose that we may have a grape, if we have it not now in the Duchess, that is as well adapted to exportation as the White Malaga, and of much better quality. What has been done can be done again. Nature has in her laboratory infinite stores of the same elements which have produced our finest fruits, and we have only to knock at her portals, and pronounce the sesame, when she will open to us the secrets of her wonder-working power."

Varieties.—Among the many varieties of grapes cultivated, there are some which will thrive best in the Northern section of the country, others that seem better adapted to the Middle portion, others still that attain their most perfect development at the South, while there are a few varieties that can be relied upon for good results in almost any portion. Like most other fruits, the grape varies more or less in quality, according to the section in which it is grown.

Concord.—This is one of the best of the older varieties of grapes, and is probably raised more extensively in this country at the present time than any other. It succeeds well in about all parts of the country, but probably better at the West and South than in New England, although growing in the latter section more commonly than any other variety. It thrives finely as far south as Florida. It was raised from seed by Mr. E. W. Bull, of Concord, Mass. The vine is very hardy, vigorous, and productive. The berries are large, globular, nearly black, and thickly covered with bloom; flesh sweet and juicy; bunches large and compact. Ripens early.

Catawba.—An excellent variety of native grape that originated in the State of Maryland. It does not ripen sufficiently early for cultivation in the Northern States, but is one of the best kinds in sections adapted to its growth, and is a very popular and profitable market variety. It seems to be most rich when grown in clay shale soils, but does well in those that are gravelly or sandy. The bunches are of medium size, somewhat loose; berries rather large, pale red in color, covered with a lilac bloom; very juicy and sweet, with a musky flavor, and highly aromatic. The fruit may be kept fresh till late in winter, with proper care. The vine is very hardy and productive, but uncertain, except in favorable locations.

Brighton.—This beautiful and excellent grape originated at Brighton, N. Y., being a cross between the Concord and Diana Hamburg. The vine is quite hardy, very productive, and a rapid grower. The bunches are of medium size, moderately compact; berries medium

BRIGHTON GRAPE VINE.

(From a photograph showing three feet section of the original vine.)

size, round, light bright red at first, changing to a dark crimson or maroon when fully mature, sometimes almost black, and covered with a thick lilac bloom; skin thin; flesh sweet, juicy, and slightly aromatic. It has its best flavor when first ripened. An early ripening variety of good quality.

Hartford Prolific.—A fine, early grape raised by Mr. Steel, of Hartford, Conn. It thrives well at the North, and is hardy and productive. The bunches are rather large and compact; berry large, globular, sweet, and aromatic; skin thick, black, and covered with bloom. It is one of the earliest ripening grapes, but is liable to drop its fruit from the bunch as soon as ripe.

Moore's Early.—This is a fine, early grape raised from seed by Mr. J. B. Moore, Concord, Mass., and was selected from 2,500 seedlings. It is one of the earliest varieties,

ripening before either the Concord or Hartford Prolific. It resembles the Concord in general appearance and flavor, although thought by many to be superior to the latter in quality, and is very hardy and prolific.

Pocklington. — A large showy grape raised by Mr. J. Pocklington, Sandy Hill, N. Y., from a seed of the Concord. The vine is hardy, vigorous, and prolific, with short-jointed shoots, and large, downy leaves. The fruit grows in large, compact bunches, the berry round and large, pale yellow or whitish yellow in color when fully matured, covered with a light bloom. When fully ripe the flesh is juicy and sweet; ripens about the same time as the Concord. The cut of this variety on a previous page was made from a photograph of fruit grown by Mr. Geo. A. Stone, of Rochester, N. Y.

Clinton. — A vigorous, hardy variety, very prolific, and grows well at the North, and succeeds best on a moderately light soil. Bunches very compact, rather small, long, and narrow; berries round, rather small, black, covered with a thick bloom, juicy, somewhat

THE PRENTISS.

acid, with a brisk, vinous flavor, and possesses good keeping qualities. With proper care, the fruit can be kept nearly all winter. Ripens quite late, or after frost.

Delaware. — The origin of this grape is not known. It is an old variety, and was found many years ago growing in the garden of a gentleman in Hunterdon County, N. J. The vine is rather slow in growth, with short-jointed wood. It is quite hardy in sections suited to its growth, and requires a rich soil, well drained, to produce the finest fruit. It is one of the most valuable kinds for general cultivation, and is very productive. The bunches are quite small, and very compact; berries small, round, light red in color, with thin, transparent skin. It is exceedingly sweet, rich, sprightly, vinous, and aromatic. It does not prove hardy at the North.

Prentiss. — A seedling of the Isabella, raised by Mr. J. W. Prentiss, Pultney, N. Y. It is very hardy and prolific. Bunches of medium size, and compact; berry medium, round, inclining to oval; skin thick, greenish white, pale yellow with a thin whitish bloom; sweet, juicy, and pleasant flavored. The above illustration was drawn from a branch of this fruit twenty inches in length, grown by Mr. T. S. Hubbard, of Fredonia, N. Y.

THE DUCHESS.

Duchess.—This fine grape was produced by crossing a White Concord seedling with the Delaware or Walter, the pollen of both being applied at the same time. Bunches rather large, compact; berries slightly oval; color pale greenish yellow when fully ripe; flesh juicy, spicy, sweet, rich, and of excellent quality. It ripens a little after the Concord. The cut of this grape, which we insert, was drawn from fruit grown by Mr. R. H. Haines, Moorestown, N. J., and is a good illustration of the variety.

Niagara.—A recent variety originating at Lockport, N. Y., by a cross between the Concord and Cassady. The vine is vigorous and healthy, and is a rapid grower; bunches medium in size, or rather large; berry large, slightly inclining to oval, pale yellow, with a thin, whitish bloom when fully mature; flesh tender, sweet, and juicy, resembling in flavor that of the Concord. It ripens about the same time as the latter.

Jefferson.—This was produced by a cross between the Concord and Iona, at Newburgh, N. Y., and is a comparatively new variety. The bunches are large, sometimes double-shouldered, compact, with a slightly oval berry; skin light red, with a lilac bloom; flesh juicy, sweet, rich, slightly vinous, and aromatic. The fruit has excellent keeping qualities, and will remain fresh, with proper care, for a long time after gathering. It ripens about the same time as the Concord, or a little later.

Vergennes.—This variety originated with Mr. Wm. Greene, Vergennes, Vt., who gives its history as follows: "The Vergennes grape is a chance seedling found growing in my garden, where there are more than twenty varieties in bearing. Its vigorous growth and healthy appearance induced me to let it remain until it fruited. It has now been in bearing five years, and has proved extremely productive. Clusters and berries large, holding firmly to the stem; color light amber, flavor rich, and ripening in this locality fully as early as the Hartford Prolific, and its keeping qualities are superior to any variety that I know of. I had the fruit the middle of March almost as fresh as when picked." The vine is said to be a very vigorous, rapid grower, and does not winter-kill easily. The cut of this variety which we insert was drawn from a photograph of fruit raised by Mr. T. L. Perry, Canandaigua, N. Y.

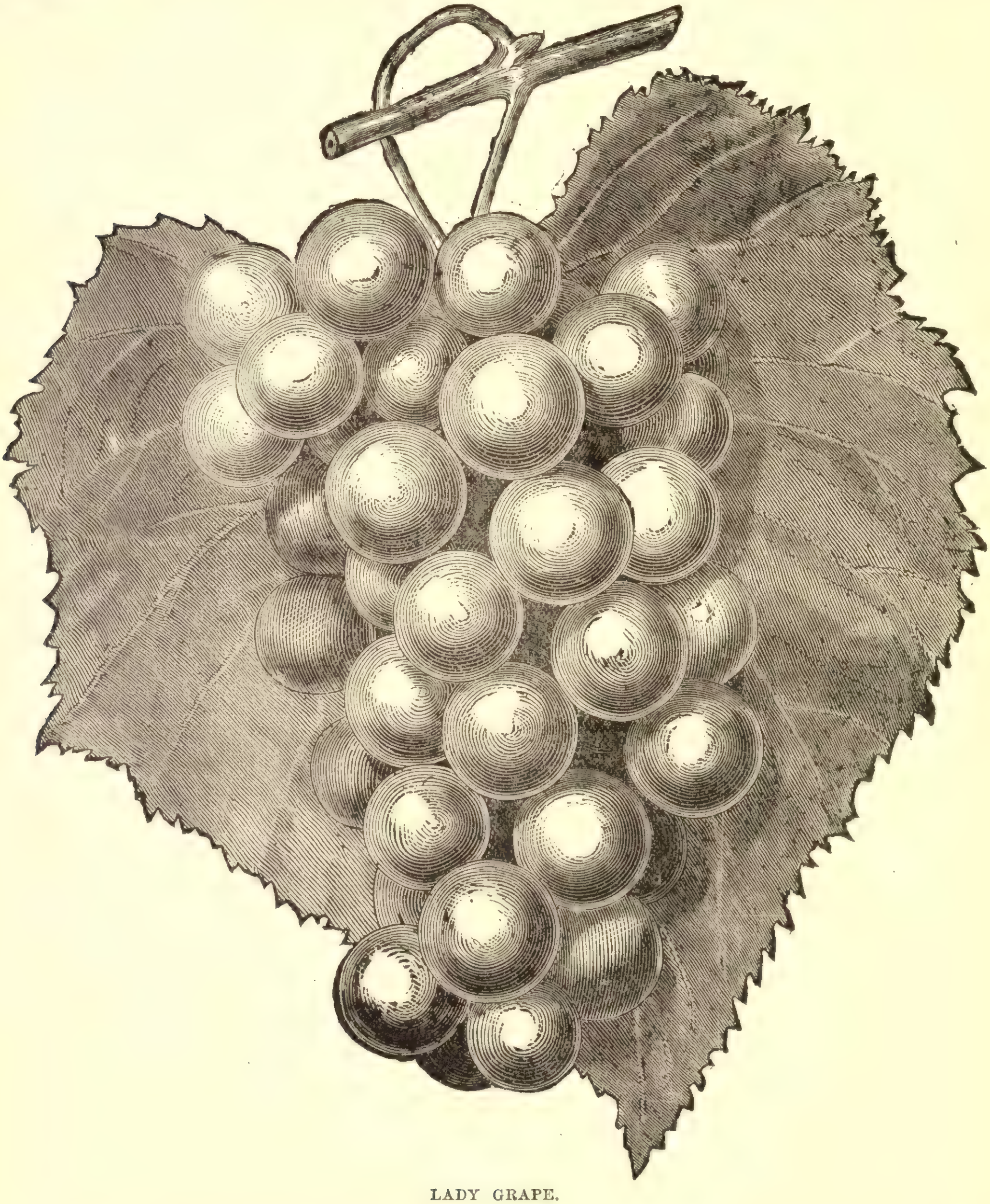
Wilder (Rogers No. 4).—This is a fine variety that ripens about the same time as the Concord. The vine is hardy and vigorous, the bunch large and compact, berry large, round, black with slight bloom, flesh sweet, juicy, rich, and aromatic. The fruit adheres well to the stem, and keeps well after it is gathered.

Worden.—This is a new variety, a seedling of the Concord, that is succeeding finely in all localities where it has been introduced. The vine is very thrifty and vigorous, healthy, and a good bearer. The bunches are large and handsome, double-shouldered; berries sweet, lively, with a slightly foxy or native flavor. Being slightly earlier than the Concord, it ripens well in cold localities.

Scuppernong.—Mr. Downing gives the following concerning this variety: "The Scuppernong grape is a very distinct Southern species, found growing wild, from Virginia to Florida, and climbing the tops of the tallest trees. It is easily known from every other grape by the small size of its leaves, which are seldom over two or three inches in diameter, and by their being glossy and smooth on both the under and upper surfaces. These leaves are roundish and closely serrated, and the young shoots are slender; the old wood is smooth, and not shaggy, like that of most vines.

We have made several trials with the Scuppernong grape, but find it quite too tender for a Northern climate, being killed to the ground by our winters. At the South it is very hardy, productive, and an excellent wine grape. The White and Black Scuppernong scarcely differ, except in the color of the fruit. The *tendrils* of each correspond with the color of the fruit. Bunches small, loose, seldom composed of more than six berries. Berries round, large. Skin

thick, light green in the white, dark red in the black variety. Flesh quite pulpy, except when very thoroughly ripe, juicy and sweet, but with a strong musky scent and flavor. It attains its highest perfection in Georgia, but succeeds well throughout the Southern section."



LADY GRAPE.

Lady.—A fine, early grape, quite hardy, and is considered by many as one of the best of the white varieties. In color it is very attractive, being a greenish-yellow covered with a white bloom; seeds few and small, skin thin, pulp tender and sweet. The berry hangs firmly to the bunch, which is of medium size. The above cut was drawn from fruit raised by Mr. William Parry, Cinnaminson, New Jersey. The vine is sufficiently hardy to succeed well in all grape-growing localities, and is generally reliable.

Other fine Varieties are the DIANA, a grape of good keeping qualities, but of peculiar flavor; vines rather tender for cold localities; the MARTHA, a white variety, quite hardy, flesh sweet, slightly foxy, and ripens about the same time as the Concord. IONA, a fine variety with good keeping qualities, hardy, productive, and is considered by many superior to the Delaware. WYOMING RED, a fine, new variety resembling the Delaware, but of double the size; ripens early. LADY WASHINGTON, a seedling of the Concord crossed with Allen's Hybrid. Bunches large, compact, shouldered, sometimes double-shouldered; berry medium size; skin pale yellow, with a slight tinge of pink when exposed to the sun; flesh juicy, sweet, slightly vinous. The fruit keeps well, and ripens about the same time as the Concord. The CREVELING, ISABELLA, LINDLEY (Rogers No. 9), MASSASOIT (Rogers No. 3), BARRY (Rogers No. 43), are also all good varieties.

Soil, Choice of Vines, etc. — Grapes will grow in almost any soil that is suitable, if not too wet; warm, deep soils being preferred. Strong, loamy soils are excellent, limestone and clay shale being generally considered the best, while it is absolutely necessary that the soil be warm, open, and with a sunny exposure. In order to secure a sunny exposure, the land should slope to the south, but if it slope too much the land will wash badly.

Dr. Jabez Fisher, of Fitchburg, Mass., one of the best authorities on grape culture in the United States, says with reference to this subject: "We want as much of a southern slope as we can get without sacrificing too much. In that way we get south fifty or a hundred miles. That is one way to overcome the difficulty of being too far north. Then again, the particular lay of the land has considerable to do with the ripening of the grape. If we locate our vineyard in the bottom of a valley, where it is very hot in the day time, where, perhaps, the thermometer would show the highest average range of temperature during the season, we are liable to have severe frosts early in the autumn, which, although they will not spoil the grape, will injure the foliage, and very much retard the ripening. That is to be avoided. The tops of hills are also to be avoided; because they are of lower temperature, — they are further north. The very best place is on a southern slope, about two-thirds of the way up, situated on some high ground, but still sheltered by the tops of the hills. That seems to me to be the most favorable location we can get. The grape is a plant that likes heat above all things. It does not care for much moisture, but it wants plenty of heat and sunlight.

Then, in the choice of soil, the same thing is to be considered. We at the North want to get as far South as we can in that respect. Hence, we do not want a strong, clayey, deep loam; we want something that is a little lighter, and that is warm. We want a soil that will take and retain the rays of the sun as much and as long as possible. We want to raise the temperature of our climate as much as we can. Hence we would choose a piece of light soil. But there comes in the objection: a very light soil will not produce the finest grapes for market, although it may ripen them earlier than stronger soil. We are aiming at the very finest results. What I mean by success is, that we shall get a first-class product, that shall bring the highest price, or give the most satisfaction if we eat it ourselves. If we go further north, then we must choose a lighter soil and thus give increased heat and shorten the time of ripening. If we go further south, we may choose a stronger soil, as the season is longer. The further north we get, the lighter the soil must be on account entirely of this matter of heat. But right here I should choose neither the strongest nor the lightest soil. I should prefer a moderately strong, friable loam, if I could get it, on gravelly bottom; but such lands are very uncommon. We want land that is naturally drained, because a piece of land naturally drained is drier and better than a piece of land that has to be artificially drained, the soil being of the same quality. If it is not of the requisite character, so far as drainage is concerned, it must be artificially drained.

Having selected our location and our soil, we are next to consider what is to be done towards preparing the land and setting out the vines. In preparing the land, but very little

of that kind of labor is required that used to be talked about a great deal in the books some years ago. We used to be told that we must trench our soil two or three feet deep, if we would grow grapes successfully. I think that idea has been exploded, as far as we are concerned. If you go south five hundred or a thousand miles, there it is necessary to trench; there you want to get a more permanent moisture. It is a different kind of business there from what it is north. Here we want to get all the effect of the sunshine that we can; we want to get all the heat and retain it all. Hence, the original preparation should be very shallow, and the after-cultivation should be of the same character. We want to encourage the formation of roots near the surface all the time, and never to induce them to go deeply, out of the influence of the sunshine.

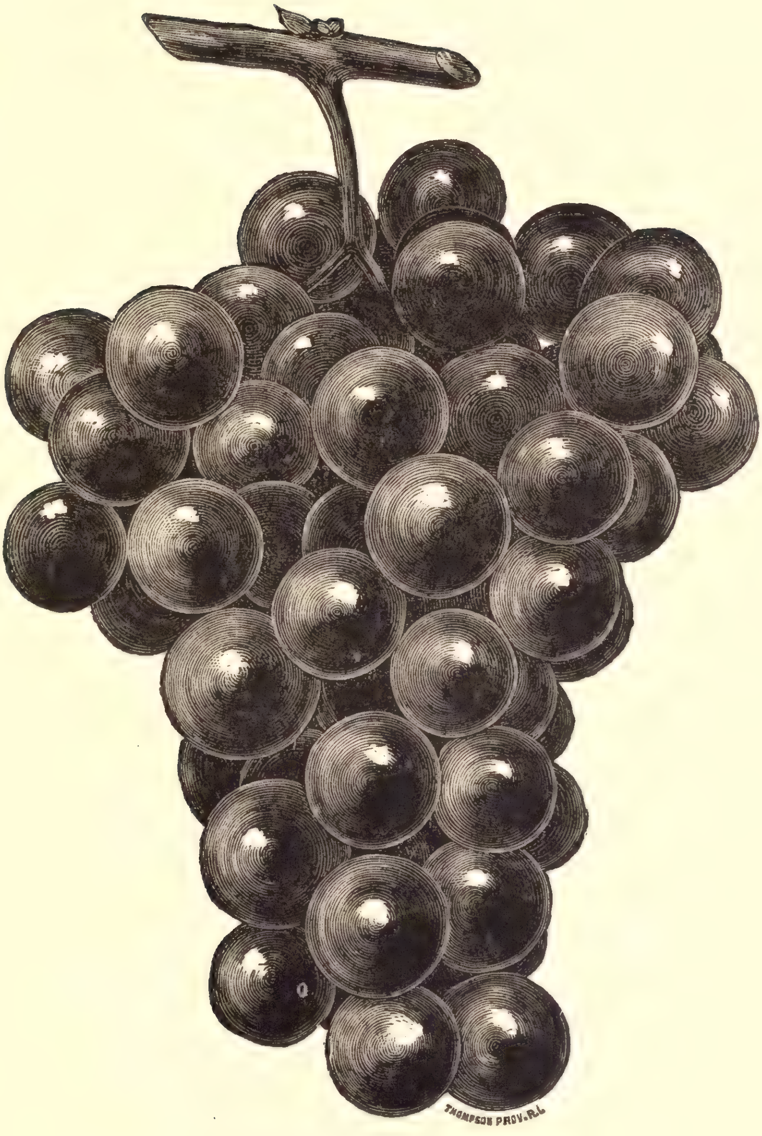
The preparation, therefore, should be simply shallow plowing. Perhaps 'shallow' is not sufficiently definite. Some people call three inches 'shallow,' and others call seven inches 'shallow.' I would not plow the ground for grapes more than seven or eight inches; that I call shallow plowing. I think there is another advantage in not going below that. My investigations into the character of the grape have satisfied me that the roots are not, generally, more than five or six inches deep. They are spread out in the ground, a perfect network, at about that depth, with only an occasional straggling root growing down deeper. The grape, as I have said, is a plant which loves heat, and it very naturally keeps its roots near the surface, where they get the heat.

It makes very little difference in what condition the ground is before you begin. There is no coating of manure that can be put upon the soil that equals the sward; I do not know of anything that compares with it. It is not very comfortable to work upon the first year, or until it has rotted, but I would never rot it by raising a crop; that uses up half of it. I would rather the nutriment contained in the sod would go to my grapes that I am planting than to something else beforehand.

We do not want to feed grape vines largely with ammoniacal manures. They cause an exuberant growth of foliage and wood; they do not bring us fruit. We want another class of fertilizers. Hence barn-yard manures are not the things to apply to grapes, and we do not want land that is full of anything of the kind. Whatever there is in the land should be rotted, unless it is sward, which does not have the influence that barn-yard manures do in their green state.

Having prepared the ground by simply mellowing the surface in any way, whether it has been under cultivation or whether it was in sward, we are prepared to grow and plant the vineyard. The first thing is, to select our vines. The best way is to go to a man who knows how to grow vines, and buy them from him. I believe in specialties in almost everything. The man who grows grape vines as his business will grow better vines than a man who does not make that his business, but who grows only a few. It is a very easy matter to grow grape vines; anybody can do it. But the trouble is this: if an amateur plants a lot of cuttings and gets a thousand vines, that he wants to set for fruiting, he will be sure to use a good many that are worthless, and should be thrown away. If he buys them and pays his money for them, he will buy the best, or should buy the best. Therefore, I would recommend farmers to purchase the vines of some experienced grape-grower, rather than to undertake to grow them themselves. Besides that, one year's growth is gained, which is virtually one year's crop of fruit.

There is some difference in the quality of vines. If I were to buy vines, I would take the very cream of those one-year-old, and pay the price; the two-year-old vines I would not buy if one-year-old ones were to be had, and the three-year-old vines I would not buy at all. My experience in setting out vines and trees has been, that the young trees and young vines always succeed best in the end. If we buy yearlings, we are very sure to get the whole system of roots; if we buy two-year-old vines, we do not get the whole system of roots,



VERGENNES GRAPE.

unless they have been transplanted. If a little pains is taken in removing a vine when it is a year old, the whole system of roots cut off the length of two or three inches and re-set, then we get a new system of roots from the whole center, and they do not grow so far; then we are more likely to get a strong vine; hence, if a vine has been grown two years, it is not so objectionable, although it is not, in my view, quite so good as a first-class one-year-old vine. I buy young vines, because I can get the whole system of roots. I care nothing for the top of a tree or vine; we can make the top if we have the roots; but we cannot make roots in open air culture, having nothing but the top to aid in producing them."

Transplanting.—Grape vines may be transplanted either in the spring or fall, but when done in the latter season, it should be sufficiently early to have them become well established in the soil before it freezes, otherwise they will be liable to be winter killed in the cold latitudes. The soil should always be in proper condition, mellow, and not too wet, whether the transplanting be in the fall or spring; it should also be done as early in the season as possible, so that the vines may have the advantage of the roots obtaining a good vigorous start. If set in the spring, the risk of loss during the winter, if it should be unfavorable, will be avoided. The soil should be in good condition, made mellow by the plow or spade. Never permit strong manures to come in contact with the roots. Bones are excellent fertilizers for grapes. In setting out grapes in gardens, it is a good plan to plant underneath the roots, and cover with soil, a quantity of old bones as food stored up for the roots of the growing vine, upon which they may feed as the bones gradually become decomposed. The vines for vineyard culture are planted in rows at distances varying according to the vigor of the growth of the vine; long jointed, vigorous growers for instance requiring more room than short jointed, moderately growing vines; the Concords for instance, which are vigorous growers, are frequently planted eight by eight feet, or eight by ten feet apart, while the short jointed, less vigorous growers like the Delaware, may be planted four by six feet, and varieties intermediate between these six by eight feet, and the rows eight feet apart, which will give about nine hundred vines to the acre. Crowding should be carefully avoided. The rows should run north and south in order to get the largest amount of sunlight possible, each plant getting the morning's sun on the east side, thus every branch and leaf is exposed to the sunlight during the day. Besides this, a greater advantage is gained at the time of the ripening of the fruit, since the sun shines directly upon the ground for three or four hours during the middle of the day, warming the soil, which retains the heat during the night and radiates it, consequently the temperature of a vineyard thus planted will be several degrees warmer than it would be otherwise, and the fruit ripens more rapidly and perfectly.

Stakes and Trellises.—The vines are generally trained on stakes or trellises, the latter being generally considered the most economical.

Dr. Fisher, the authority previously quoted, gives his method of arranging a trellis as follows: "The posts are made of two-inch square chestnut. It is, perhaps, not quite as cheap as unsawn timber, but it is very much handsomer, and if your vineyard is in sight, it will look very much better. These posts are set six feet apart through the whole vineyard, one post for one vine; they are set two feet and a half in the earth and five feet and a half out, being eight feet long. My custom is, to set the *end* post right by the side of the first vine, which makes it nine feet from the next one. The others are six feet apart. I put a brace in at the end, bracing the outside post to the foot of the next one, which brace is set into a little shoulder just sufficient to hold it. Then, upon these posts, wires at stretched. I have used various kinds, but the last was number nineteen galvanized wire, which I am inclined to think will give me better satisfaction than anything else. The lower wire is placed twenty inches above the ground, a little higher than I used to put it, for the purpose of keeping the

grapes on the lower part of the trellis out of the dirt. A year ago this last autumn, there were heavy rains through the month of September, that spattered a great deal of soil upon the grapes, and it was very difficult to get it off. It troubled me so much that I decided that the lower wire should be raised to about twenty inches from the ground. The next wire I put fifteen inches above that. The next wire is fifteen inches above that, making four wires in all."

Another method is to secure a cross bar three or four feet long to the top of each post extending across the rows, with three or four wires stretched along on these cross bars to hold the permanent arms of the vine, the new growth and fruit hanging down from the wires. This mode saves the labor of tying, and the bearing shoots do better to hang down than to be trained upward. The posts should be at least six feet above the ground, and the wires should be stretched very tight. A wire trellis should be provided the second year of the growth of the vines.

Culture and Pruning.—The culture of grapes is very simple, being similar to that for Indian corn, except perhaps more shallow, so as not to disturb the roots. The harrow should be called into frequent requisition to keep the soil clean of weeds, and this can be best accomplished by destroying them as soon as they make their appearance and before they have had time to become established in the soil. The rules for grape culture must of course vary somewhat, according to the peculiarities of the climate, soil, the variety, exposure of land, etc. Frequent cultivation is a great benefit to grapes, as well as to other fruits. The object of pruning is to give a preponderance of roots over the top, and by cutting away the top of any plant that lives through the winter, we secure this object, so that the next season we shall have a stronger and more vigorous growth. There are various methods of pruning adopted. The usual custom is to allow but one cane to grow the first year, this being from the most thrifty and promising bud, all others being rubbed off early in the spring, or as soon as they are developed, all the sap and strength of the plant going to form one shoot.

Late in the fall this branch is cut back to three or four buds. The second two canes are allowed to grow from this stem, these being from the most vigorous buds, the others being rubbed off as before. By this means the canes grown receive a large portion of the sap and strength of the plant, and the roots have a fair chance for growth, superfluous vines not robbing them of their nutriment. During the following summer no pruning will be necessary, except to pinch off all inferior shoots. The following autumn the two canes are cut back to three or four buds each, leaving a bud upon the main stock to grow a cane the following year. The third summer, the two canes may be allowed to bear a *very* few clusters of fruit if desired, but if permitted to overbear when so young they will be liable to be permanently injured. The thinning of the fruit should be done with sharp scissors, instead of a knife. After the fourth year the vines can be trained in any style desired. Another method of training sometimes practiced is to permit two canes to grow during the second season as previously recommended, pruning them in the autumn at from three to four feet from the main stem, and fasten them horizontally along the lower railing or wire of the trellis.

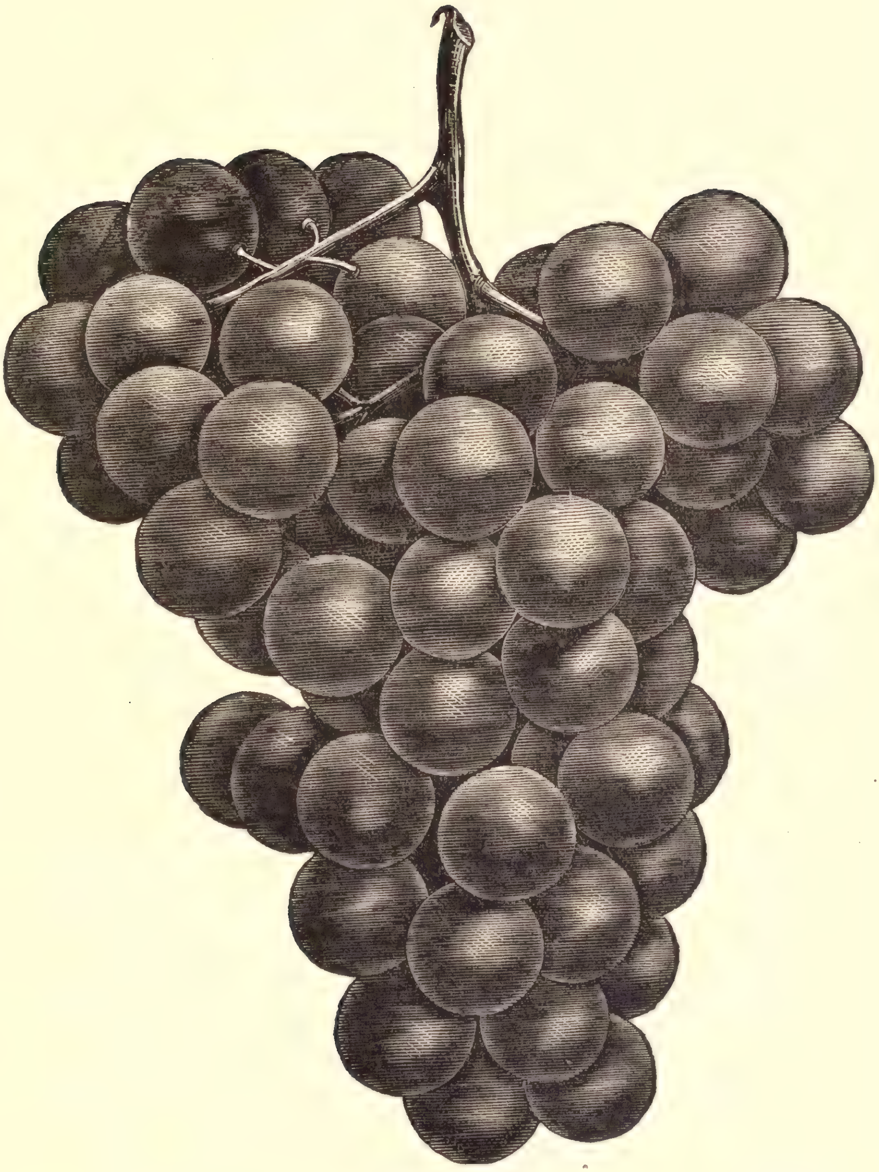
One bud is left to form an upright shoot about every foot of these canes, the others being rubbed off. Each fall or spring the laterals are all trimmed out, leaving only the two horizontal branches, and eight or ten upright. Two years from this growth, and every year afterward, each second or third upright cane may be cut back to within one bud of the main arms or branches, and thus new wood for fruit growth be constantly supplied. Another plan is to permit the vines to grow fan-shaped upon the trellis, renewing some of the canes occasionally by cutting them back. Another plan is to allow three or four upright canes to grow to a stake, cutting one or more of the canes back nearly to the ground occasionally to renew the wood, as only the new wood produces the fruit. The vine dresser must bear in mind that the object arrived at is to have the vine make the proper amount of new wood and

no more, for a good yield of fruit, and in pruning bearing vines, the old wood should be cut away and the new wood left, a few strong branches being left each year to provide a growth of canes for the next season.

When old vines that have not been systematically pruned are to be dealt with, the main canes should be left as long as space will allow, and each lateral or shoot pruned down to a single bud. When the vine starts in the spring, or after the vines have obtained sufficient strength to secure them against accident, the superfluous ones may be rubbed off, for several will be liable to start out, and if all are allowed to grow they will not be strong and vigorous, nor produce as good fruit as the well pruned vines. When the fruit has well set, the small, imperfect branches should be thinned out, by cutting them off with a pair of scissors; this will insure the growth of larger and more perfect branches of fruit, as well as fruit of a better quality than if all the branches were allowed to grow. About this time also, the bearing shoots should be pinched off about three leaves beyond the last bunch of grapes, so that there may be no surplus growth to take the sap of the vine from the growing fruit, the latter requiring it for its most perfect development. When the future bearing canes have attained a desired length, the ends should also be pinched off or shortened in. Young shoots from the roots or below the arms should be taken off as often as they appear, unless they are desired to renew the main arms. The best time for the general pruning of grape vines is when the sap is dormant, after the leaves fall in the autumn, since they are less liable to profuse "bleeding" than in the spring. When the larger branches bleed badly, grafting wax may be applied to check it. Summer pruning and care of grapes is a pleasant occupation, and is attended with but little labor. After several years' bearing, grapes are apt to deteriorate in flavor and size. The vines may be rejuvenated by cutting down the main horizontal shoots at the bottom of the trellis and permit new upright shoots to grow in their places, which will produce as fine fruit as the first vine.

Hastening the Ripening of Late Varieties, etc.—The time of ripening of late varieties like the Isabella and Catawba, may be considerably hastened by cutting off one-third to one-half of the clusters when they are small. When the fruit commences turning in color a few leaves that shade the clusters most may be removed, thus partially exposing them to the strong sunlight, but care should be exercised not to remove too many leaves. In sending to the city markets, grapes are generally packed in small paper boxes, or in baskets holding from six to ten pounds each. The principal expense in the cultivation of grapes is in the care of the vines, and gathering of the fruit, they requiring but little manure. The yield sometimes attains to four tons of grapes per acre, but such large products are apt to injure the vines, and it is better to limit it to about two tons per acre. The cost of cultivation, training, and gathering is generally averaged from $75 to $100 per acre, while the sales per acre will range from $125 to $600, according to the season, state of the market, variety, etc.

Winter Protection of Vines.—In very cold sections, many grape growers give the vines protection in winter. When this is done, they should be taken from the trellis before severe weather commences, and be laid upon the ground, fastened down with wooden pegs, and a layer of two or three inches of soil given them. Straw or fine boughs should be used instead of soil, where the earth is inclined to be too wet. Merely laying the vines upon the ground is generally thought to be better than to permit them to remain upon the trellis. Dr. Fisher expresses a different opinion, and says in this connection: "Grape vines grown in a proper manner will ripen the new wood as thoroughly as white oak will ripen its wood. The grape vine is just as hardy as the white oak. If it is not ripened, it will winter-kill. If it is ripened, it will not. If you overload the vine, if you attempt to grow so many grapes that you do not succeed in ripening the wood, it will winter-kill. I have not laid down a vine for five or six years, and I have not had a vine killed in that time, except one or two



THE BRIGHTON.
(Drawn from fruit grown by Mr. H. E. Hooker, Rochester, N. Y.)

that mildewed." Hardy vines that are kept well pruned and otherwise well cared for may not require winter protection, except in the very extreme limits of Northern culture; but varieties that are somewhat tender for the latitude should, we think, be covered.

Grapes in Winter. — With but little care some varieties of grapes possessing good keeping qualities may be kept till midwinter, or even late in the spring. As it is such a delicious and healthful fruit, the luxury of having it through the winter will well repay the trouble of properly storing it for this purpose. The Catawba, Diana, Isabella, Wilder, Vergennes, Iona, Clinton, etc. — such grapes as have a thick skin and are rich in quality — are the best for this purpose. Pick the fruit when perfectly ripe and dry, and place the bunches in a cool room for two or three days, where they will not be shriveled by the air being too dry, or moistened by its being too damp. Handle very carefully, always taking the bunches by the stems, and remove all bruised or loosened berries from each bunch, since such will soon decay and have a tendency to make the sound fruit decay also. Then place the bunches carefully between layers of wheat chaff, or maple or basswood sawdust that has been thoroughly dried, and put in a cold place. Sometimes rye straw or fine, soft hay, cut with a machine into one-half inch lengths, is used instead for layers. Cotton batting or soft paper is also frequently placed between the layers. The bunches should never be packed but three or four layers deep, as the fruit in the lower ones would otherwise be liable to be crushed by the weight of those above. Cover the top layers of fruit well, to exclude the air as much as possible. A fruit room cooled with ice is of course the best place to keep such fruit, but where this cannot be had the boxes or crates containing it may be placed upon the ice in the ice house, and covered with heavy blankets or a deep layer of dry sawdust. Care must be exercised that the fruit is not stored in such a way as to gather dampness, as it will then be liable to mould. Another plan is to pack the bunches in small paper boxes, or in shallow drawers in a cold room. where the fruit will not freeze, but be kept uniformly cold. Cellars are generally too damp for this purpose, but when sufficiently dry and cool they are excellent for storing grapes. Bunches cut with a portion of the vine attached, the ends of the vine sealed over with sealing or grafting wax, and placed in a cold, dry room, will keep for a long time. By simply placing the grapes in a moderately dry, cool room of even temperature, grapes can frequently be kept from four to eight weeks, according to the temperature and variety.

Diseases and Insects. — The *mildew* and *rot* are diseases with which the grape growers of this country have most to contend, while the principal insect enemies are the large yellow vine beetle and the grape-vine flea beetle, which are very destructive to the foliage and buds. For description and remedies see special department on this subject.

Wine Making. — Wine is most commonly made from the juice of the grape, although it may be made from the juice of any other fruit, such as blackberries, raspberries, currants, strawberries, etc. The following directions for making domestic wines from grapes will be found reliable and explicit. The amount of sugar may be varied according to the natural sweetness of the grapes; the amount herein indicated applies to such varieties as the Catawba and Isabella. Care should be used to have the grapes for wine *perfectly* ripe, for if not its quality will be greatly deteriorated.

Select perfectly ripe bunches, and then carefully pick off the stems and remove all grapes which are not quite ripe; the stems will injure the flavor. Squeeze the juice out, either by hand or press, strain through a hair sieve, and pour it at once into a clean, sweet barrel or keg, adding to the vessel two gallons of water for every gallon of juice made. At the same time put in four pounds of sifted sugar per gallon of juice. In adding the two gallons of water, let it strain through the pulp, skins, etc., of the residuum of the grapes, after being squeezed.

Fill the vessel full, up to the bung-hole, which cover with a sand-bag, to allow the fermentation to escape. Watch the barrel daily, and clean or scrape away the scum, which will be thrown out in large quantities. As the wine falls below the bung, fill up daily (after clearing away the scum) with sugar water, made with two pounds of sugar to the gallon of water.

The fermentation will continue from three to six weeks, according to the weather. When it has ceased, pour into the bung-hole about one gill of brandy to the gallon of juice, to flow over the surface and prevent its souring (the brandy may not, however, be indispensable). Then bung the vessel up tight. During the cold weather, in say the following February, when the wine is perfectly still and clear, draw it off into any other clean vessels; then quickly clean, scald, and rinse thoroughly the barrel in which the wine was made, and return the wine to it, bung it up, and draw it off as required for use.

If you wish to make a very palatable champagne, have the champagne bottles ready when you rack off the wine; put a tablespoonful of common syrup in each quart bottle; then fill with the wine, leaving about one and one-half inches space below the bottom of the cork, which fasten very securely with strong twine, as the pressure of the gas to escape is very great. The wine will improve by age, after the drawing off as above recommended. An old brandy or whisky barrel is the best for this purpose. Never use a new barrel, as the wine will taste of the wood. About fifteen pounds of grapes will give one gallon of juice. The riper the grapes, the better the yield of the juice. One gallon of grapes in bunches weighs about four and a half pounds. Keep the wine in the cellar, where it will not be exposed to extremes of temperature. An approximate estimate of the quantities required for a thirty-gallon barrel will be as follows:

To Make Thirty Gallons of Wine. — One hundred and fifty pounds grapes, yielding ten gallons juice; twenty gallons water, strained through the pulp residuum; forty pounds sifted sugar; two and a half pints common cider brandy. If carefully made, the wine will be wholesome and palatable, with a flavor like grape-juice Madeira. It is stated that wine made according to the above directions was preferred to all others at the Washington hospitals during the late war.

Figs. — The fig is a native of Asia and Africa, it properly belonging to a warm climate, although it may be raised in some portions of the Middle States with suitable care. In many of the Southern States it thrives quite well, producing fruit of excellent quality. The principal obstacle to its culture in the United States, however, is the cold of winter, which sometimes destroys, even in Florida, trees that are unprotected. On the Pacific coast the fig finds a more congenial climate. Figs can only be well ripened, and raised for preservation in a dried state, where the summer and autumn are warm and dry. The tree is remarkable in one respect, viz.: in producing fruit without its being preceded by any apparent blossom. There are, however, blossoms that are concealed in the interior of a fleshy receptacle, which is hollow, pear-shaped, and nearly closed, but which is lined throughout with a number of small flowers. Fresh figs are very sweet, being destitute of acidulous flavor, and, although greatly relished by some at first, are too sweet and cloying to be palatable to others, until they have acquired a taste for them. They are a very agreeable, wholesome, and nutritious food, and in warm climates are regarded as one of the favorite fruits. The tree grows somewhat in the form of a shrub, three or more stems sometimes growing from one root. It attains a height of from twelve to twenty feet, the limbs being stout and branching. It commonly produces two crops of fruit each year; but in Asia Minor, where the best figs of commerce are chiefly grown, three crops are frequently grown, the fruit of the third crop ripening after the leaves have fallen. The first crop, ripening towards the last of June, and the summer yield, which gives employment to a large population, comes to market in September and October

Varieties.—There are numerous varieties of figs, many of which are well adapted to this country, such as the LEEMAN, a large, bell-shaped fruit of a brownish yellow color, sweet and juicy; the CELESTIAL, a smaller, dark variety, less juicy, but more sweet than the former, and better adapted for drying; the BROWN TURKEY, a large, early, hardy variety, as well as an abundant bearer, skin dark brown covered with a thick blue bloom, flesh red and of delicious flavor; the BRUNSWICK, one of the largest and finest purple varieties. Other varieties might be mentioned as of fine qualities, such as the MALTA, BLACK ISCHIA, NERII, and WHITE ISCHIA.

Cultivation, etc.—The fig is generally propagated by cuttings, which are made eight or ten inches in length of the last year's shoots, with about half an inch of the old wood left at the base. The cuttings may be taken off in March, and planted in a light soil in a hot bed, or early in April, in a shady place in the open air. The best soil for figs in this climate is a mellow, calcareous loam, of moderate depth, neither too wet nor too dry. If the soil is too moist, the tree will expend its force in the production of coarse wood, rather than fruit; while if too dry, the fruit will be liable to drop off before becoming fully ripened. The best manure is generally conceded to be a mild lime compost. In sections where there is a tendency to overgrowth of wood, root-pruning has been found very beneficial in promoting fruitfulness. Winter protection will be found beneficial to the fig tree in all sections where there is much frost.

Oranges.—The orange is a native of Asia, and is the most delicious fruit among the many varieties of the citrus family. The foliage of the tree is rich and aromatic, and its beautiful white blossoms surpass those of all other fruits in fragrance. Southern Europe, China, and the West Indies have furnished the largest supplies of oranges for the markets of the world, while within a few years past great interest has been awakened in Florida in the culture of this fruit. The portion of the United States best adapted to the production of oranges is Florida, together with a considerable portion of the States bordering on the Gulf of Mexico, and Southern California, many of the groves in some of these sections yielding as large and profitable crops as any in the world. The orange groves of St. Augustine and other portions of Florida are becoming quite noted for their excellent products. An orange tree will arrive at a bearing age in about eight years from the seed, or five years if grafted or budded on to the wild fruit. At eight years from seed they will, with good care, be from ten to twelve feet high. The bearing will of course be light at first, the product being increased year by year with proper care. Orange trees are long lived, and have been known to bear for more than a hundred years.

A tree in full bearing will produce annually from 2,000 to 10,000 oranges. From 48 to 100 trees are planted to the acre; the latter number, however, renders them too crowded. The wild orange is frequently used for grafting the better varieties upon, since the latter are thus made more hardy. In sections where there is much frost in winter, protection should be given the trees at that season, as the freezing and sudden thawing of the sap in the wood, thus rupturing the sap vessels, is very injurious to the trees. The orange is much more delicious when perfectly ripened upon the tree than when gathered before being fully ripened, as all of the oranges of commerce are, in order to bear transportation.

Varieties.—Among the varieties of orange most highly recommended by European authorities are TANGIERINE, a delicious early variety; the MANDARIN, somewhat larger than the former, but rather small, flattened, with a thin rind, flesh dark, orange colored, juicy and rich; a Chinese variety; the ST. MICHAEL, a small fruit, with pale yellow skin, thin rind, seedless, juicy, and sweet; it is considered by many the most delicious of all varieties. The MALTESE BLOOD, of medium size, blood red pulp, and excellent flavor. The BERGAMOT; fruit pear-shaped and noted for a peculiarly delicious fragrance, from which perfumers obtain

their bergamot essence. The HAVANA, a sweet orange of fine quality; the ST. AUGUSTINE, a large variety of the Havana, and superior to it in quality. The orange of PORTUGAL, or common sweet orange, is a tree growing to a great height; the fruit is ordinarily round, sometimes flattened, and occasionally a little oblong; rind reddish yellow, and aromatic, flesh sweet and juicy.

The CHINA orange is one of the most delicious of all varieties, being exceedingly sweet, juicy, of delicious flavor, and highly aromatic. The skin is smooth, glossy, and thin. Gallesia thus describes the RED FRUITED ORANGE: "It is a singular variety. Its appearance, its leaf and flowers are all exactly like the common orange. Its fruit alone is distinguished by a color of blood, which develops itself gradually and like flakes. When the fruit begins to ripen it is like other oranges; little by little spots of blood-color appear in its pulp; as it advances to maturity, these enlarge, becoming deeper, and finally embrace all the pulp and spread to the skin, which is, however, but rarely covered by the peculiar color; yet this sometimes occurs, if oranges are left on the trees after the month of May. This orange is multiplied only by grafts, having few seeds, and those of little value. Its branches are without thorns, its fruit sweet, but less so than the China orange, and it has a thicker skin."

Mr. T. W. Moore, of Florida, one of the best authorities on the culture of this fruit in the orange-growing section, says respecting the varieties cultivated in the Southern States:

"Almost every community where the orange has been long grown from seed, has some excellent and well-marked variety. Some of these varieties vary greatly. Some ripen early, and others late. Some have thick, tough skins with finely-flavored fruit and well adapted to shipping a long distance, while others are of such a delicate skin and pulp, they will have to be eaten nearer home. Some are large and light bearers, while others are small and heavy bearers.

Many varieties differ in color, from the pale orange to a reddish orange, and even to blood color. It would be well for those who intend planting budded trees, or propose budding trees now growing, to select the most excellent kind, whether they have yet been honored with a name or not, as it is the *quality* of the fruit and not the name which is needed. The name and classification will come in time. Any new and remarkably good varieties ought also to be brought to the notice of the State committee, above named, on nomenclature. These gentlemen will do their duty, and Florida will be compelled to have her own nomenclature, as she has her own varieties. The orange of Portugal and the China orange are two well known varieties in Europe, and are frequently seen in Florida, but have changed somewhat by having been reproduced from seed.

So far, the Florida Fruit Growers' Association has determined through its committee the nomenclature of our own varieties." The following are some of the varieties mentioned: The TANGIERINE (previously described), DANCY'S TANGIERINE, in flavor and external appearance superior to the original. Seminal variety of the Tangierine raised by Col. F. L. Dancy, Buena Vista, St. John's county, Fla. NAVAL ORANGE.—Size large to very large, eye presenting an umbilical appearance, stem inserted in a shallow-ribbed cavity, with deep lines; flesh very fine, melting, and tender, juice sweet, sprightly, vinous, and aromatic; quality first; origin, Bahia, Brazil. SWEET SEVILLE (Hick's), size small, slightly flattened, color deep, eye small, without depression; skin very smooth, grain very fine, juicy, and melting; juice very sweet and sprightly; quality best; a superior fruit in every respect except size. Supposed to be a seedling raised at Arcadia, St. John's Co., Florida. ARCADIA, size large, form somewhat flattened, color deep, skin smooth, color of flesh deep, grain rather coarse, juice slightly sub-acid, quality good. Supposed seedling raised at Arcadia, Florida. NONPAREIL, size medium, grain fair; pulp melting, sub-acid, and vinous; quality good. Seedling raised by Mrs. Mary Richards, Duval Co., Florida. MAGNUM BONUM.—Size large to very large, color light, grain fine, juice sweet, rich, and vinous; quality best, and seedling raised at Homossara, Florida.

Buena Vista.—Size medium, color dark crimson, color of flesh very dark, pulp coarse but melting; juice sub-acid, sprightly, with vinous flavor; quality good. Doubtless new and improved varieties of the orange will be introduced from time to time, the same as with other fruits, as its cultivation is becoming rapidly extended, and the interest in it is constantly increasing in those sections best adaped to its growth.

How to Plant an Orange Grove.—The following directions for planting an orange grove, its cultivation, etc., are given by Mr. T. W. Moore, of Florida, who has been engaged in successful orange culture for many years, and to whom previous reference has been made. The several methods are, first, the budding of the wild sour trees without moving them; 2d, budding them first and planting afterwards in some suitable location; 3d, planting the sour stumps and budding afterwards; 4th, growing the trees from sweet seed without budding; 5th; planting the sweet seedling and budding either before or after removal from nursery; and 7th, a grove of sweet seedlings.

Each of these plans has some advantages over the others. They all have advocates; but which of all has the greatest number of advantages is questionable. I have tried them all, but after stating the advantages of each, must leave to the grower to select for himself as circumstances and inclination may control. If one is impatient for return, let him choose the sour grove, if he can find it, and bud the trees where they stand. With proper management he may begin to gather in two years. If he is still impatient, but cannot find a sour grove, let him buy the sour stumps, plant them in some suitable location, and he may begin to gather fruit in three years from planting. But if he can wait awhile longer for fruit with the hope of getting a longer lived tree and more abundant yield let him plant *younger* trees, either seedlings or budded stock. If he wishes an early bearer and comparatively smaller tree, he can select the *sour* seedling budded. If a larger but later bearer, he can select the *sweet* seedling budded. If he wishes an abundant yield and the largest trees, and can wait a longer time, the sweet seedling, unbudded, will suit. With good treatment such trees will begin to yield in eight years, and, after a longer time, in ninety-nine cases out of a hundred, give him a fair quality of fruit; but perhaps he will have as many varieties or sub-varieties as trees in his grove. The sour stock for a few years grows more rapidly, but will finally make a smaller tree than the sweet. The best quality of fruit can be insured only by budding from the best varieties.

Special reference should be had to drainage, soil, water protection, forest protection, proximity to fertilizers, and facilities for transportation. The soil for a grove should be thoroughly drained, either naturally or artificially. Not only should the surface water be carried off, but the drainage should be so deep as to allow roots, and especially the tap root, to penetrate for several feet. Some think that less than ten feet is not sufficient. But there are in this State groves of fine old trees and good bearers with considerable less than ten feet of drained soil. The sour stock will flourish on a much wetter soil than the sweet. And it may be that these groves that have long done well in such localities are sour stocks budded. Where choice of location can be made, and especially if sweet stocks are to be planted, select a soil well drained by nature. Art and labor can accomplish a great deal, but it costs something, and the effect is not so permanent as when nature has done the work. If no positive evil arise from a wet subsoil in close proximity to the surface, still there are reasons why a deep, dry, or moist soil is better. While it is true that the principal feeders of the orange lie near the surface, yet whoever will take the pains to examine the roots of an old orange tree grown in a deep and well-drained subsoil will find that these roots have penetrated for many feet deep into the earth, and in all directions from the tree. Now if trees have been set twenty feet apart in the grove, and the soil is drained but one foot deep, the roots of each tree have but four hundred cubic feet of soil in which to feed. But if the soil has been drained to the depth of ten feet, then the feeding ground for the roots has been increased

ten fold, and instead of four hundred cubic feet of soil in which to feed, the tree has four thousand cubic feet. This advantage is more especially to be considered where the subsoil is sandy, as in such a soil, air and other nutriment for the roots penetrate to a greater depth. But there are some of these wet soils found in our State that are positively poisonous to the orange, as they contain a large per centum of salt—*chloride of sodium.*

The orange will grow in a variety of soils—in clayey, sandy, shelly, or loamy soils; in hummocks black or gray, on pine lands, or black-jack ridges. It does well on soil underlaid with clay or sand. It will even do well on a light soil underlaid with white sand if fertilizers are annually applied. But whoever wishes to plant an orange grove should be careful to select the best available soil. Perhaps the poorest soil suitable for orange growing is that underlaid with a white sand, as such a soil leaches very readily the soluble manure. Perhaps the best soil is found in our dark gray hummock, with deep soil underlaid with a yellow clay or yellow sand subsoil.

The natural growth should be tall and large, with an abundance of live oak and hickory, as such a growth would indicate an abundance of lime. Of our pine land that on which the hickory is found mixed with the pine, with yellow subsoil, should rank first. Such a soil is really a mixed hummock and pine. Next to this is the pine mixed with willow, oak, and black-jack. Considering the ease with which such lands as the last two classes are cleared and planted, the readiness with which the orange grows on them, they deserve a high rank, and especially if fertilizers are close at hand. In selecting a location in the purely pine lands, select that which is thickly set with tall trees, well drained, and with a yellow sub-soil. Such soils, if occasionally dressed with alkaline manures, grow the orange admirably.

While with proper care the orange may be grown successfully in almost any portion of the State of Florida, still it is wise to select a location which may combine all conditions favorable to the best results. In budding, but one plan, that of inserting a single bud, is practiced. The graft has not done well. Grafted trees will live, but they do not grow so thriftily as the budded tree. Grafting is sometimes resorted to when one wishes to preserve a new variety and he has obtained a cutting of this new variety in winter when the sap is not in condition for budding.

Transplanting.—Before the work of transplanting begins, the soil for the grove should be well prepared. It is most generally the case that the great hurry to get the trees into the ground causes much neglect at this point, but this policy is a bad one. The haste should have reference to the early fruiting and rapid growth of the tree; and they are not brought about by careless preparation of the soil. The soil should be deeply and thoroughly broken, and the ground cleared of the roots. To insure the setting of the trees a proper and uniform depth, the ground should be well leveled with a harrow or drag. No manure should be used at the time of setting, nor before, unless applied some months previous, and thoroughly incorporated with the soil.

The best time for setting trees is the late winter or early spring before the new wood has started. The ground is then cool and the roots in as dormant condition as at any time during the year. It is better that the ground should be wet and the setting followed by showers. But wet soil is not so essential at this time of the year as it is when the transplanting has been done later and the ground and sun are warmer. Where trees are to be set under forest protection so that they will escape any damage from frost, the late fall is the best time, as trees set at that time are well established and ready to start by the spring.

In taking up the trees great care should be taken to prevent breaking or bruising the roots. As many roots as possible should be taken up. If the distance from the nursery to the site of the grove be short, and the nursery rows have been well manured with muck, and the ground is wet at the time of lifting the trees from the nursery, much of the soil can be taken along with the roots. Immediately on lifting the roots from the ground they should be

trimmed with a sharp knife wherever they are found to have been bruised or broken. The lower part of the tap-root also should be cut off to prevent its doubling up on being reset. Twelve or eighteen inches is sufficiently long for the tap-root. Put the tree under shade and cover the roots with wet moss as soon as possible. Do not allow the fibrous roots to dry, as they are very delicate and soon perish. Keep them protected up to the moment of setting, taking but one tree at a time from its covering of moss. To insure still further against damage to the tender roots, have on hand a half barrel of muck made into a thin paste, and as fast as the trees are lifted and the roots trimmed, plunge the roots into this paste, take them out and wrap in moss.

The holes for the trees should be freshly dug. The work of setting is easily and rapidly done by three hands working together — one to dig the holes, one to prune and set the tree, and a third to fill in. The holes should be dug in the shape of an inverted saucer or truncated cone with about two inches of the top cut off. Proceed thus: Around the stake which marks the place for the tap-root, with a shovel or hoe take away the soil, letting the tool strike the top of the soil at the stake and continue to dig deeper into the soil until at a distance of eighteen inches from the stake it has penetrated six inches below the surface. Proceed thus around the stake until it is completed. This gives the greatest depth of the hole on the outer edge. or perimeter of the circle. Now take up the stake, cut two inches of the top off the cone. Where the stake stood, push down with the spade by working it back and forth until it has penetrated the ground about eighteen inches, or the full length of the tap-root of the tree to be set. Now insert the tap-root in this hole made by the spade. Be careful not to set the tree deeper than it grew in the nursery. With the hand pack the soil firmly around the tap-root. Next spread the lateral roots over the cone, taking care to distribute them evenly over the cone. Throw on two inches of dirt and press it firmly with the feet. Finish by throwing in soil and leveling the ground, leaving the last layer of soil untrod.

Before the tree is left it should be trimmed with shears in proportion to the trimming done to the roots. If planting is done in summer or in hot weather and the ground is not protected by forest trees it is better to mulch. If the trees are older than three years, and wild grown, it may be necessary to dig the hole deeper than directed above, but the point of this caution is against deep setting. The writer is satisfied that more trees have been diseased and retarded in their growth and frequently killed by deep setting than by any other one cause.

The distance apart that the trees should be set will depend upon the character of the trees. The seedling should have the greatest distance, the sweet seedling budded less, and the sour stock budded least of all. Where land is laid off in squares the following table will give the number of trees that will stand on an acre:

Distance apart.	No. of trees in squares.	No. of trees in diamond.
15×15	164	180
18×18	114	125
20×20	90	99
21×21	81	89
25×25	53	58
30×30	36	39

Cultivation. — The orange will live with almost no cultivation, but it will only be a sickly existence. We know no plant, shrub, or tree, that will pay better for good cultivation; none that will respond so certainly to thorough cultivation. The ground in the grove should be kept level; the surface light. As far as the roots have extended the surface should not be stirred deeper than three inches. The more frequently it is stirred, the better. Beyond the reach of the roots it is well to cultivate deeply and frequently, but as the roots extend them-

selves this area of deep cultivation should be lessened. After the roots have extended themselves well over the ground, the best plow to be used is the sweep. A single thirty-two inch sweep, or a gang plow, the middle or front plow twenty-two inches wide, and the two side plows, fourteen inches each, does excellent work. It is better than the turning plow or cultivator. The sweep is much more uniform in the depth of its cutting than either. It is much more rapid in its work than the single plow. It is more apt to cut off the weeds below the surface and destroy them, than the cultivator. With such an implement, a grove free from stumps and litter is easily and cheaply kept in fine condition.

While the orange trees are young, it is of advantage to keep the ground planted in garden crops — peas, beans, potatoes, tomatoes, anything that requires frequent work and will mature within a few weeks, partially shading the ground. Of course nothing should be taken from the ground without making adequate return in the form of manures.

Where the trees are planted far apart and ten or twelve years will elapse before the ground will be all occupied by the orange, grapes and peaches will do well and prove profitable, provided the soil is well drained. At no time should the roots of grass and weeds be allowed to mat themselves on land growing the orange. Not only will they draw heavily upon the soil while they are growing, but when turned over the turf and matted roots will necessarily leave the surface very irregular, causing the ground to dry rapidly under the influence of the sun and wind.

In cultivating the grove with the plow there is a constant tendency of the soil to pile up around the trunk of the tree. This should be watched, and if the crown of the lateral surface roots is a half inch below the surface, from this or from deep planting, the soil should be drawn from around the trunk till the upper sides of these roots are brought to the top of the ground. If the upper parts of these roots are left bare, for one or two inches, where trees are five or six years old, and for a greater distance where the trees are older, these roots develop very rapidly and not only furnish stout braces to the trunk, but great arteries for conveying life and food from the soil.

Pruning. — Do the principal pruning in the spring. By all means avoid fall or winter pruning, as it is apt to start new wood at a time when it is most exposed to damage from frost. Cut off all dead wood, and up to, or a little into the living wood. Thereby the wound heals more readily. As a general rule, cut off all diseased branches; especially if they have become so far diseased as to fail to develop healthy leaves. Do not trim up the trunk too high. Encourage the lower branches to extend themselves well around the trunk and far over the surface of the ground. If they do not touch the ground they are not too low. As the tree grows these branches will continue to droop nearer the ground until the lowest may have to be cut off after a while; but this late cutting off is much better than to have the trunk exposed either to sun or cold.

Give and keep an open head to the tree. To do this, select the most vigorous lateral branches, leaving some on all sides of the tree so as to obtain a head as uniformly balanced as possible. After cutting off the other branches close to the trunk, trim up these selected branches almost to a point, leaving only a few of the terminal smaller branches. When this is done the tree will look like a skeleton, and you will likely conclude you have used the knife too freely. But if this pruning has been done in the spring and you keep the 'water' shoots pulled off the trunk, and cultivate well, you will find the trunk by winter enclosed by a beautiful head with a dense wall of foliage on the outside. The next spring trim these laterals in a similar manner, allowing the first laterals to rebranch a little distance from the trunk so as to be able to fill up the larger area by fall. Continue this method till your tree is large enough to bear its first crop. You can then slacken your pruning so as to encourage the fruiting.

Fertilizers.—It is not safe to manure trees at the time of planting. In some instances this has succeeded very well, but only when the manure has been long composted and frequently turned, so that no fermentation will occur around the wounded roots. When manuring must be done thus early it is better to scatter it on the ground and turn it several times in the soil some weeks before the tree is planted. After the tree has been planted and once started to grow it is then well to manure it heavily till it begins to bear. Begin with a moderate quantity, applying nearer the outer extremity of the lateral roots and increase the quantity every year and enlarge the area to which it is applied. Orange trees should never be stimulated in the fall or latter part of the summer. It is much better to manure in the spring. Another advantage to be noted is, when trees are pushed before coming into bearing, the heavy manuring does no damage to the fruit. After trees have begun to bear it is better to manure heavily once in four or five years.

Manuring bearing trees, and especially when the manuring is heavily done, has a tendency to make the oranges split and drop off the first year after manuring; and even when they do not split, the fruit for the first year is not so sweet and is more liable to rot soon after picking. To insure a good general yield and salable fruit each year the manuring should be applied alternately to different parts of the grove, laying off the grove into four or five equal parts and manuring the first part the first year, the second, the second year, etc. The kind of fertilizer to be used depends largely upon the character of the soil.

Some of the commercial manures are valuable when used in combination with other things, but none of them contain in right proportions all the elements needed for the orange. A good article of ground bone, where the oils and phosphoric acid have been too generally expelled by burning; Peruvian guano, and potash, both the nitrate and sulphate, are very good when combined with muck. These are especially valuable when early vegetables are to be grown among the orange trees, as they highly stimulate the soil and hasten forward both the vegetables and the orange trees. Land plaster should be especially mentioned as beneficial to our sandy soil, as it not only furnishes an important element to the soil, but in the absence of clay in most of our soils, furnishes a valuable absorber and retainer of the volatile manures so easily expelled by our abundance of sunshine. The writer thinks he has seen another advantage in the use of land plaster in the check which the sulphur, contained in the plaster, has upon some of the insects which damage the trees. Green crops turned under are highly beneficial to young trees. Rye, oats, and barley sown in the fall and turned under in the spring, and followed by one or two crops of cow peas during the summer help forward a grove of trees wonderfully. It is still better if this be accompanied by a liberal dressing of wood-ashes. One ton to the acre is not too much. Manures from the stables, cow-pens, hennery, and pig-sty, indeed from every place where waste is deposited, should first be deodorized by the liberal use of land plaster or sulphate of iron—copperas—dissolved in water and composted with muck, and be carefully saved and utilized. As they are highly stimulating they should be composted with three or four times the quantity of muck, and frequently turned before using.

But of all the manures, that which is cheapest and most abundant is the muck to be found in our rivers, creeks, lakes, and ponds. Before trees reach the bearing state they should be fed with nitrogenous manures; but after they have begun to bear, potash and kindred manures should be liberally used. Nitrogenous manures encourage the development of new wood foliage, while lime and potash are necessary to an abundance of fruit. The yellow leaves of the tree indicate a deficiency of nitrogenous manures, while the dark green leaves show an abundance. On the other hand rust on fruit shows an excess of nitrogenous manures, and the writer has found a correction of this in using the slacked lime from burned oyster shells sown broadcast. The lime, in sowing, should be allowed to sift lightly through the branches and leaves of the tree. It should be applied before the trees bloom and when the foliage is dry.

Gathering and Packing for Market.—In gathering, cut the stem, leaving half an inch of stem on the orange. Place the different varieties in heaps by themselves. Cover lightly with straw for three or four days, the longer time during cold weather and the shorter time during warm weather, that the oranges may sweat. After this time place them in latticed bins, holding from one to two hundred oranges each, to dry. In putting them into bins assort them with reference to size, color, and perfection, so that the classification may be complete. They can now be packed at leisure, for after they have been dried out without being bruised they will keep indefinitely. The boxes for packing should be of light material, neatly made, tolerably close, and hooped. Dimensions $8 \times 16 \times 27$ with partition in the middle. In making these one side should be left open. In packing the open side should be turned up, and the box lined with sheets of paper laid on the bottom and resting against the side. Each orange should be wrapped separately in tissue paper containing as little oil as possible, so that it will readily absorb and throw off moisture.

The wrapper should be careful to reject every bruised or otherwise injured orange. The packer should be careful not to put different varieties in the same box. The buyer should know when he has tasted any orange from a box or brand that all others of the same brand or box are its equal. In packing, the oranges should be placed closely together in layers, so that there can be no rolling or sliding of the fruit in the box. The last layer should project three-fourths of an inch above the sides of the box, so that the top when nailed on should hold the layers firmly to their places, even after there has been some shrinkage to the fruit. This is all-important when the fruit has to be transported a considerable distance; and especially when transported by rail. The box should now be marked with the number of oranges and the brand of fruit.

Diseases and Insect Enemies of the Orange.—The orange has comparatively few diseases or insect enemies. One of the most formidable diseases is the dying back of the new wood to the old, sometimes confined to a few branches of a tree, and sometimes embracing nearly all of them. This is frequently caused by the sting of an insect to the new wood, or it may originate near the roots. Deep planting will produce such symptoms. We have occasionally dug up trees so afflicted and found them wanting in new roots. The remedy is to reset, or else take away the top soil till the lateral roots are brought near the surface, and to keep the soil well cultivated. The better plan is to take them up and reset them. Cut away all diseased wood and roots. When the extremities of roots of trees come in contact with poisonous earth a similar symptom is produced, as in planting upon hard-pan or over a stratum of salt earth.

Rust on the orange (fruit) has been a considerable cause of annoyance to some growers, because it mars the beauty of the fruit, though it does not affect its sweetness, nor its flavor. It is a disease confined exclusively to the outer skin. Whether it is a true rust, or is simply an absence of the essential oil so abundant in the peel of the yellow fruit, the writer is not fully satisfied, though inclining to the latter opinion. Fruit so affected has one advantage. It keeps longer than that enveloped in the lighter and more oily skin. The writer has had no difficulty in removing this disease. At different times and on different trees he has changed, in a single year, the color of the fruit from a dark-brown to a bright-yellow and smooth skin, by the application of slacked lime from oyster shells, as before noticed. Whether the lime acts as a corrective of disease, or whether its presence was needed in the soil for the perfecting of the fruit, or whether it absorbed carbonic acid and so furnished the additional amount of carbon necessary for the manufacture of the essential oil by the tree, the writer knows not. But the fact of benefit is not doubted.

Where moss appears on the trunks of trees, it is easily removed by any alkali wash. Soap suds, or what is better, wood ashes, will both fertilize and cleanse. The cracking of the

fruit is occasioned by any suspension of the growth of the fruit, and a consequent hardening of the rind followed by a sudden flow of sap from any stimulating cause, as highly fertilizing a bearing grove, especially during summer, or a wet spell following a dry. The cracking is more apt to follow the rains, if trees have been highly manured even in winter. This can be prevented by keeping the ground well stirred during dry weather. The soil thus stirred, absorbs moisture and keeps the fruit growing.

Insects.—The insect which was at one time considered the most injurious, was the long scale insect, resembling one side of a distorted mussel shell, and was called by Packard, *Aspidiotus Gloverii.* When it first made its appearance in Florida, it threatened universal destruction of the orange groves. Several remedies have been found effectual. The most effective yet known to the writer is a decoction of tobacco with sufficient carbolic soap to make a strong suds. Apply with a garden syringe or pump, through a perforated nozzle. Kerosene, in the proportion of one part of kerosene to eleven of water, applied in the same manner, is effective. But there is danger if too much be used. A moderate amount is a good fertilizer and stimulant to the tree. As there is no chemical affinity between the kerosene and water, the mixture has to be kept vigorously stirred during the time of applying it. Either of these applications has to be repeated two or three times at intervals of ten or twelve days.

The wood louse, or white ant, has occasioned serious trouble, and sometimes death to many fine young trees where the preventative was not used—ashes or slacked lime around the base of the trunk. When a tree begins suddenly to show yellow leaves examine a few inches below the surface at the base of the trunk for wood lice, especially if a stake has been driven near the trees for its support, or if litter from the forest or mulching of leaves has been used. If wood lice are discovered clear them away carefully, pour boiling water into the cavity around the tree until all the cavities in which the lice could have concealed themselves have been reached. If the tree has been but partially girdled it will recover, if the soil be placed above the wounded part. But if the tree has been completely girdled, get well rotted muck and pile it for three or four inches above the wound, and cover over with sand. Finish with a top-dressing of fresh wood ashes or slacked lime. If the tree is not too far spent, it will send out young roots above the wound and finally recover.

Two other insects damaging to orange trees are to be noticed. These insects are very dissimilar in appearance, but the injury done by them very similar. One insect is a spider with a long, slender body. When at rest its fore legs extend forward, and the hind legs backward, and all parallel with the body, which clings closely to the branch or leaf on which the insect rests. I am fully satisfied that it is the cause of one of the forms of the disease known as the die-back. Early in the morning the insect is usually found on the tenderest shoots of the orange, and wherever found the indications are the same. If the shoot is very young and tender, it begins at once to lose its freshness, and ceases to grow; a little later it assumes a rusty appearance, and finally dies. If the shoot is a little older when attacked, or if the insect has moved lower down, after exhausting the extremity of the shoot, and attacks the stronger wood, a blister appears on the bark, and, if examined, a collection of sap is found just under the puncture made by the insect, and between the bark and the wood. The sap soon hardens into a gum. If the sap is flowing very vigorously at the time the bark is punctured, a little sap flows from the puncture and hardens into gum. The branch is evidently poisoned by their operations, and frequently dies down to the wood of the previous growth. If the tree is abandoned to the insect, the young wood is soon all killed.

The other insect to be noticed resembles the squash bug, and is called by the entomologist of the Department of Agriculture, *Euthoctha galeator.* These insects are very bold in their attacks. I have watched them frequently in their operations as they were lying in the hot sun basking, while their probosces were inserted in the tender shoots. I have held my mag-

THE SHARPLESS SEEDLING.

nifying glass within a half or three-quarters of an inch from them, and had the finest opportunity of observing the operations of this bold enemy of the orange. I have seen the tender shoots wilt, when the insect was sucking them, from the extremity to the point at which this insect had inserted its proboscis. As this insect is larger than the spider, the injury inflicted by it is much more speedy. But when the shoot is older and more vigorous, the effect is very similar to that produced by the spider.

As no natural enemies to either of these insects are known, watchfulness on the part of the orange grower is alone to be relied upon for their destruction. They should be caught by hand, or in a net, and killed. The insect last described is very apt to conceal itself under litter during the winter. Pieces of bark, boards, logs, stumps, litter of every kind offer them shelter. In early spring; when the weather is cold, everything of the kind in the vicinity of the orange grove infested should be burned. The insect is very fond of sucking the cow-pea, and lays its eggs near its field of operation, often on the under side of the leaf of the plant on which it feeds. If the orange grower will grow cow-peas in his grove, and bury them in trenches or holes dug at the extremity of the orange roots, a few days after these insects have commenced to feed upon the peas he can destroy them at a most important time. Both these plans were adopted by the writer during the present year, and his grove is now quite clear of this pest.

When trees have been damaged seriously by either of these insects, the knife and saw must be freely used. Cut away all diseased wood. Let the cutting be so heavy that the tree will start strong shoots. Watch these young shoots carefully, in the early morning, for the spider, and, when the sun is warm, for the bug resembling the squash bug. Kill all that make their appearance. If the extremities of the shoots have been stung, pinch them back. They cannot be saved if the wood is very tender. If blisters appear in the harder wood, puncture them with a knife. It will relieve the wood, which will readily heal, and the branch will soon recover its vigor.

Lemons. — The lemon belongs to the *Citrus* family, and resembles the orange in general appearance, although it does not form the close head of deep green foliage that characterizes the latter, the leaves being paler in color, more sparse, with translucent dots seen when held between the eye and the light, these dots being oil glands that give them their fine aroma It is not as hardy as the orange, but requires similar culture. Wherever it will succeed, its culture is exceedingly profitable.

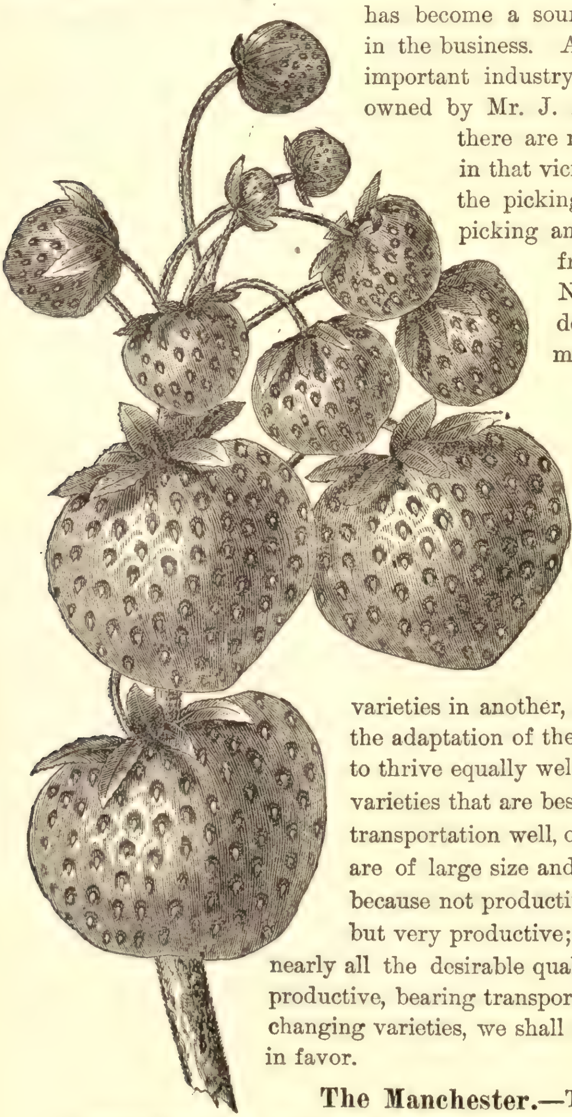
Limes. — The lime differs from the lemon by its smaller flowers and fruit, while the juice, although quite sharp, is not quite as rich as that of the lemon. It also grows upon a small, dwarfish tree or shrub, and is a native of Asia. Limes are cultivated in nearly all warm regions, the culture being similar to that of the lemon.

SMALL FRUITS.

STRAWBERRIES. — The strawberry is the most delicious and wholesome, as well as the most extensively cultivated of all berries, it being found in this country from Maine to Texas, and in California and other States on the Pacific coast. It may be said to be almost universally grown, it being a native of the temperate latitudes of both hemispheres, and found in Europe, Asia, North and South America. The species, however, that are found in different portions of the world differ in many respects, cultivation having resulted in producing different classes of fruit. The name of this berry is said to have had its origin from the common practice of placing straw between the plants in cultivating, in

order to keep the fruit free from contact with the soil. Some writer has said that "the Creator could probably have made a better berry than the strawberry, but the fact is He *never did*," an opinion in which the majority of people will doubtless concur. It is a luxury that should be enjoyed by every household in sections in which it will thrive, while the ease with which it may be grown, and its adaptation to widely different soils and temperatures, enables those possessing even the smallest garden patch to have strawberries of their own cultivation, if they desire. A plot of only twenty or thirty feet square, set to plants and well cared for, will furnish a supply of berries that would surprise those not accustomed to cultivating them.

Great improvement has been made in the production of this fruit during the last few years, not only in originating new and superior varieties, in improved methods of cultivation, but in greatly extending its culture, which in some sections has attained vast proportions, and has become a source of great revenue to those engaged in the business. At the South especially has it become an important industry. A strawberry field of 140 acres is owned by Mr. J. M. Samuels, near Jackson, Tenn., and there are many other large strawberry plantations in that vicinity. It is stated that in one day in the picking season 525 hands were employed in picking and shipping 26,000 quarts of berries from that one field. In the vicinity of Norfolk is a plantation of 250 acres devoted to strawberry culture. Thus many of the Southern States furnish enormous supplies of this delicious fruit to the great markets of the North and West, and the demand for it and the supply is yearly increasing.



MANCHESTER.

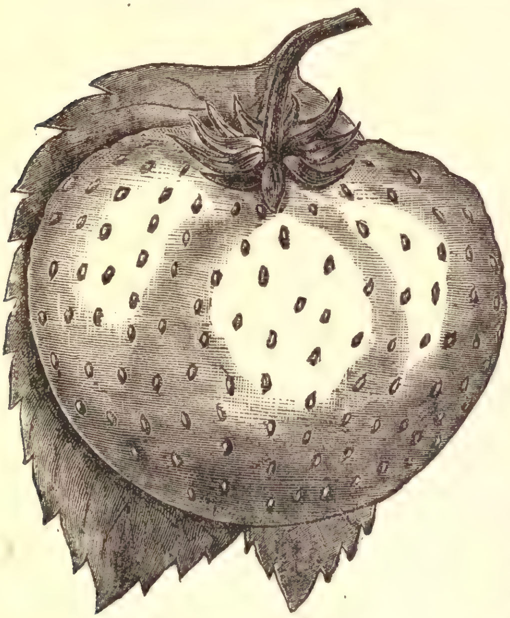
Varieties.—The varieties of the strawberry are very numerous, and the number is constantly increasing. As with all other fruits, some varieties give the most satisfactory results in one section, other varieties in another, according to the soil and climate and the adaptation of the plants to each, while some kinds seem to thrive equally well in all sections. Then there are some varieties that are best suited to home use, they not bearing transportation well, others that are quite the reverse. Some are of large size and excellent flavor, but are not profitable because not productive; others that are of inferior quality, but very productive; and others still that seem to combine nearly all the desirable qualities, being of excellent quality, hardy, productive, bearing transportation well, etc. Owing to the constantly changing varieties, we shall describe but a few of those now most in favor.

The Manchester.—This variety originated from a chance seedling found in Ocean County, N. Y. The plant is a strong, rapid grower, hardy, and very productive. The fruit is quite large in size,

form oblate-conical; color a light scarlet; flavor good. The cut of this specimen was made from a photograph of berries grown by Messrs. G. H. and J. H. Hale of South Glastonbury, Conn., and represents the natural size of the fruit.

The Wilson is an old and popular variety, raised from seed by M. J. Wilson, of Albany, N. Y. It is not of so desirable a quality as some others, owing to its being quite acid; yet it is very hardy, vigorous, and productive, and for this reason has been perhaps more extensively cultivated in the past than any other single variety. It commences to ripen early, and continues late. The fruit is large, color deep crimson, flesh crimson, tender, with a brisk acid flavor.

The Crescent Seedling.—This variety originated with Mr. William Parmelee, of New Haven, Conn. It is hardy, very vigorous, and productive, ripens early, and continues late. The plants require considerable space to do well. The fruit is of medium size, roundish in form, bright scarlet, fair flavor; flesh moderately firm. The plant requires less attention than most varieties.



CUMBERLAND TRIUMPH.

Cumberland Triumph.—This is a large fine berry, that had its origin in Carlisle, Pa. The plant has dark green leaves, and is a vigorous grower, but unfortunately not a prolific bearer. It is a fine variety for family use, but is too soft to bear transportation well.

Charles Downing.—For some time past this berry has been regarded as one of the best for home use or near market; but of late it seems to be easily affected by rust or leaf blight in some sections. The plant is very productive, the berries quite large, conical, nearly regular, deep scarlet; flesh rather firm, pink, fine flavored, sweet, and juicy.

The Bidwell is an early berry with fruit of medium size, sometimes, in rich soil, quite large; form round conical and long conical, with a slight neck; color bright crimson, with light red flesh, firm and juicy, slightly sub-acid. It is a Michigan seedling, and a good variety for either family use or market.

President Wilder was produced by Hon. Marshall P. Wilder in 1860, from the Hovey Seedling impregnated with the La Constante, and was dedicated to him by the Massachusetts Horticultural Society. The plant is healthy, hardy, vigorous, and very productive. The first stalks are short, stout, and erect. The fruit is quite large, in form roundish, obtuse, conical; color bright crimson scarlet. Flesh whitish, quite firm, juicy, sweet, and rich. There is another variety called President Wilder that originated in Europe, which is described as large, deep crimson, and of excellent quality.

Prince of Berries.—This variety originated by E. W. Durand of Irvington, N. J., possesses more than any other the flavor and aroma of the wild berry. It is brilliant scarlet in color, of large size, fine texture, ripens evenly and perfectly, and for market or family purposes has no superior. It presents its calyx in such a manner as to be easily separated from it without disfiguring the berry, while the plant is a hardy and luxuriant grower.

Jersey Queen.—This is one of Mr. E. W. Durand's most promising seedlings. Plant, a very strong, robust grower; fruit large, of fine texture, delicious flavor, and beautiful bright scarlet. A very superior variety.

The Sharpless Seedling.—This strawberry originated in Pennsylvania in 1872, by Mr. J. K. Sharpless, and is now well known in many sections of the country, where it meets with popular favor. It is large, sweet, and luscious, with a delicate aroma and firm flesh; color clear, bright red, with a shining surface. In form, it is usually oblong, narrowing at the apex, and somewhat irregular and flattened. A berry of this variety exhibited not long since at the Nurserymen's convention in Rochester weighed $1\frac{1}{16}$ ounces, and measured seven inches in circumference. Our illustration was obtained from a sketch of fruit grown by Messrs. Ellwanger & Barry, Rochester, N. Y., and is a very correct representation of this variety. The plant is hardy, vigorous, and prolific.

The "Captain Jack" is a large, fine-flavored berry, very productive and handsome. It somewhat resembles the Wilson, of which it is said to be a seedling, although it is much superior in size and quality. The plant grows luxuriantly, and is very hardy.

Monarch of the West.—This is also a large variety, which has been quite popular and extensively cultivated in the west. It requires a rich soil and better cultivation than many of the other standard varieties, in order to obtain the best results. Its chief fault is in sometimes having green ends to the fruit, which renders it not quite as available for market purposes, although for family use this may not be as objectionable. The illustration of this beautiful variety, together with those that follow, are made from photographs of the natural

MONARCH OF THE WEST.

size of the fruit, and were obtained from the well-known nurseryman, Mr. Wm. Parry, of Cinnaminson, New Jersey.

The Longfellow is very productive, ripening evenly, with no green ends, and is above the average size, the berry being long in form. Mr. Parry says of it:—

"It has furnished good picking every day for twenty days, the fruit being large and fine at the last picking; color dark red; flavor first quality, sweet and rich. Flesh very firm; ships well; grown in same beds with fifteen of the newer varieties, it combines more good qualities than any other one."

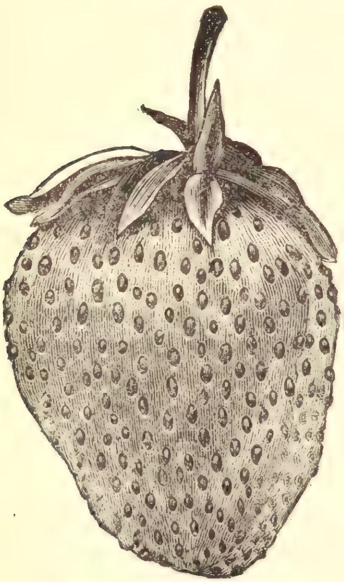
The Essex Beauty is remarkably regular in form, which is conical, with a well-defined neck; it is of fine texture and flavor, and ships better than many varieties; color a rich crimson. It is quite prolific and bears its fruit well up from the ground, ripening evenly.

The Warren is perfectly beautiful in size, form, and color, and for this reason is said to be, for a fancy market berry, one that is unsurpassed in its salable qualities, as well as in bringing the best price. It is of good, average size and delicate flavor; the color dark

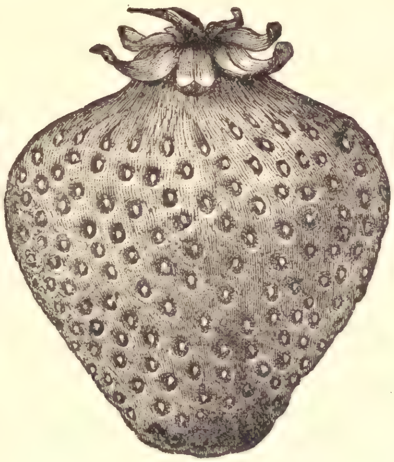
red. Besides being very productive, the plants are vigorous, hardy, and easily cultivated. Other fine varieties are the WINDSOR CHIEF, a productive variety resembling the CHAMPION; the KENTUCKY, a valuable kind, producing fruit after many varieties have ceased bearing MINER'S GREAT PROLIFIC, BOYDEN, JUCUNDA, GOV. JEWELL (seedling), a new variety of great promise, etc.

Hermaphrodite and Pistillate Plants.—Strawberries are divided into classes, characterized by their blossoms. The first is called *staminate* (or male) because the stamens are chiefly developed; the second *hermaphrodite* (or perfect), on account of their having both stamens and pistils developed; the third *pistillate* (or female), from the pistils being principally developed. A plant producing only male flowers cannot bear fruit, and is rarely found among cultivated varieties.

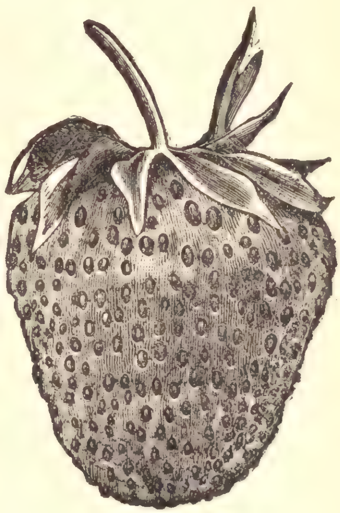
The hermaphrodites may be easily distinguished from the pistillate varieties at the time of blossoming, by the long yellow anthers that protrude from among the pistils, these being very abundant and bearing a fine dust or pollen. In the pistillate or imperfect blossomed varieties, only the cluster of pistils is visible in the blossoms, the pistils being closely packed together, and resembling a very minute green strawberry. The hermaphrodite varieties, having perfect blossoms, produce full crops without being fertilized by the pollen from other



LONGFELLOW.



ESSEX BEAUTY.



WARREN.

varieties; but the pistillate varieties (some which are very productive), in order to bear well, require a bed, or one or two rows of hermaphrodites to be planted within from fifteen to thirty feet of them, so that the pollen from the blossoms of the latter will fertilize those of the former. Varieties blossoming about the same time should be selected to fertilize each other. The hermaphrodite varieties are generally preferred by planters, since they require no care of this kind. As many of our best varieties belong to the *pistillate* class, however, as of the *hermaphrodite*.

Propagation and Soil.—The strawberry plant is easily and rapidly propagated by means of the runners, which are used for forming a new plantation or bed. New varieties may be produced by planting the seed, or by hybridizing the same as with all other plants. A deep, rich, moist loam is the best soil for strawberries, although they will grow on almost any soil that is not too wet. Vast quantities of this fruit are produced on light sandy soils, although on the former they attain their greatest perfection. When lands intended for cultivating this fruit are too wet, they should first be well underdrained. Where the soil is light or thin, the ground should be deeply trenched and manured before putting in the plants. In

preparing the land for this crop, the ground should be plowed or spaded deep, at least from six to eight inches, and sometimes two or three times their depth, according to the nature of the soil.

Care must be used not to throw up the subsoil to the surface, as it will be apt, as a general rule, to deteriorate the quality of the surface soil. It should, however be broken up if of a hard, clayey nature. The land should be thoroughly prepared and made quite rich. An extensive strawberry grower in Connecticut says:

"The main point to start with, is to have a reasonably good soil, one that will at least produce thirty to forty bushels of shelled corn per acre, well drained, either naturally or artificially, and has been cultivated in hoed crops for at least two years. Would not advise planting directly after potatoes, as they exhaust the potash from the soil, which is of great value to the strawberry plant. Plow deep, and, if possible, use a sub-soil plow. From my own experience I believe it will add at least twenty-five per cent. to the value of the crop in helping to retain the moisture in a dry season, and for a more perfect drainage in a wet one. After plowing, harrow thoroughly with a La Dow, Randall, or Acme harrow, any one of which is worth twice its cost in preparing a strawberry field. By thoroughly, we do not mean once or twice over, but six or eight times, until you think you have done it to perfection, and then harrow it over again."

Manures and Fertilizers.—Various kinds of manures are used with benefit on land devoted to the culture of strawberries, but for many soils perhaps there is nothing better than well-rotted barnyard manure. On lands that are very rich, it is better to use some of the concentrated fertilizers, as barnyard manure will be liable to cause the plants to make too heavy foliage. Bone dust, scattered broadcast and worked into the soil before planting, or when cultivating is excellent for this purpose. Well-fermented compost, of about four hundred pounds each of ground bone, wood ashes, muck, and marl, applied to an acre, makes an excellent fertilizer. Leaf mould, soil from the woods, decomposed turf, guano, hen manure, superphosphate, and most of the concentrated fertilizers are good, either used alone or applied together, or when mixed with other things in a compost. Hen manure and guano should be used sparingly, and be well mingled with the soil; if the roots come directly in contact with it, they will be injured.

Time for Setting the Plants.—Strawberry plants may be set either in the fall or spring. When set in the fall rather early, so that the roots may become well established in the soil before the ground freezes, there will be less liability of the plants winter-killing than when set late in autumn ; and when well cared for will frequently produce a small crop of fruit the next summer. Those set out in the spring will not produce many berries the first season, and should not be allowed to bear, but to develop into vigorous plants, which will be less liable to winter-kill than those set in the fall, and with good care will produce abundantly the following year.

Planting Strawberries.—The following directions for planting and cultivating strawberries, from the pen of the well-known nurseryman, Mr. R. H. Haines, of Moorestown, N. J., will be found full of valuable suggestions to growers of this fruit: The quickest method, and an excellent way when planting largely, is to open furrows with a plow at the proper distances, and then, holding the plant with the left hand against the straight side of the furrow, fill in some soil against the roots with the other hand, or with a hoe or trowel. An assistant might then press the soil firmly with his foot against the roots, if not too wet, and afterwards fill up the furrow level, or nearly level, with the surface, again "firming it" lightly.

A somewhat similar method for the garden is to open holes with a spade at the required distances, with the back of the spade against a garden line, and planting as before, spreading

the roots like a fan if possible. If planting in a hot sun, or when exposed to drying winds, the plants should be kept in pails, boxes, or lined baskets, and roots kept moist. The roots are sometimes dried more in ten minutes in the open air than in going 2,000 miles through the mails. Some persons prefer to dip the roots in a puddle made of clayish soil or muck when received, also when planting.

Another method for planting is to push the spade (or trowel) down into the soil, and then, by pushing it forward, insert the roots behind the spade without withdrawing it. This is an excellent way when planting in summer, or in very dry weather. If the soil is very dry, a pint or two of water may be poured into the cavity. River or rain water, or water that has been drawn and exposed to the air for some hours, is better than *cold* spring water. Next run the spade or trowel down into the soil, about an inch further out, and pry the soil back into place against the roots, and level off the ground.

A fourth method is to dig a hole with a trowel, and, after making a little mound in the bottom of the hole, spread the roots around upon it. Next fill in part of the soil, and if very dry pour in some water. A little well-rotted manure (not strong fertilizers), if placed in the hole before filling up, will often give the plants a good start. Before finishing, if not too wet, press the soil firmly with a trowel, or moderately firm with the foot, and leave the last half inch of soil loose, so as better to catch the rain or dew, and to prevent the soil from baking. The mound in the bottom may be omitted if time is limited.

Distances for Planting. — The "hill" system is the favorite method in garden culture, except where the soil is very light and sandy, or overrun with grubs. It merely consists in keeping all runners cut off, thus keeping each plant separately by itself. In garden culture, where the space is limited, the rows may be made either a foot and a half or two feet apart, with plants either eight, twelve, fifteen, or eighteen inches apart in the rows. A space two or three feet wide may be left between every three, or four, or five rows, to be used as a walk, or as a dividing line, or as a surface drain. If for the last purpose, it will want to be lower than the rest of the bed. The nearer the rows are to each other, the less mulching will be required. These different distances will give opportunities for experimenting, and all of them might be tried to see which will give the best satisfaction on the soils of each cultivator. Usually the largest berries are obtained from plants grown by the "hill" system, with the rows two or three feet apart, and plants fifteen inches apart, though more berries are often obtained by planting nearer together.

In field culture, the "hill" system is usually followed if the soil is heavy or of a clayey nature. The rows are then made either two and a half or three feet apart, usually three feet, when about 14,500 plants are required to the acre. If the garden plot is large, and can be arranged so as to permit of horse-power, then I would also recommend this same distance of three feet between the rows. Berries usually are sweeter and ripen more evenly when grown by the "hill" system, as they are more exposed to the sun and air than when grown in "matted" rows.

The "matted" row system consists in having the rows either three, four, or five feet apart, and allowing the runners to take root on both sides of the parent plants. It is followed almost entirely in field culture where the soil is sandy, and frequently upon gravelly soils and upon easily worked loams. The plants may be set out at twelve or eighteen inches apart, and the rows, being more widely separated, require less plants to the acre than by the "hill" system. A "partially matted row" system is to allow only four or six runners to take root from each plant, cutting off the rest. Excellent crops of fine berries can usually be obtained in this way.

Another method, called the "matted hill system," is to mark off the land both ways, as if for corn, placing one or two plants at every crossing, which may be either three or four feet from each other. Run the cultivator lengthways, and also across the row, during the

season, fastening in the first runners by hand if necessary, and narrowing the cultivator as the "matted hills" become larger. This method requires little hoeing, and gives excellent crops. In gardens, smaller "matted hills" may be made by planting three or four plants together every two or two and a half feet, or planting one plant and allowing it to make three or four runners.

Another plan for garden or field culture is to place a plant every two feet, with rows two feet apart, and to cultivate both ways, keeping all runners cut off. It is sometimes surprising to see what a vigorous growth, and what immense crops of large berries a single plant will give, when allowed plenty of room and well cultivated. All of the above plans will give good results, and they each have their supporters among different fruit growers or amateurs.

At the South, in garden culture, I am inclined to believe that where the "hill system" can be practiced, excellent results will follow having the rows fifteen, eighteen, or twenty-four inches apart, as the foliage of the plants will then nearly cover and shade the ground, and less mulching will be required between the rows. The "hill system" is probably preferable in gardens at the North, even on light, sandy soils, provided the plants are kept well mulched. It will be seen that there is here an ample field for experimenting, with its accompanying change of thought and recreation, for business or professional men. During the first year, crops of lettuce, dwarf peas, bush beans, spinach, etc., may be raised between the rows in gardens where the "hill system" is followed, and where space is limited.

To Prevent the Mixing of Strawberry Plants.—Varieties only become mixed from the runners intermingling so that the plants cannot be distinguished, or from young plants springing up from seeds. This last, however, seldom happens, and when it does the young plants are usually the same. The intermingling of runners may be prevented by having the different kinds in rows five or six feet apart, and by keeping the cultivator running occasionally during the summer. Another way is to have the different kinds eight or ten feet apart. In the "hill system," where the runners are kept cut, there is of course no danger of their intermingling, even if the rows are only two or three feet apart. When two or more kinds are planted in the same matted row, then the runners may be kept cut from the plants that join, or may be turned away from each other, or a vacancy of a few feet may be left in the row between the different kinds. When understood, it is a matter that can be easily arranged.

Cutting Off Blossoms.—Most fruit growers, and especially those who grow fruit for market, make a practice of cutting off all the blossoms from newly-set plants, as, when left on, it prevents their making as strong a growth for the main crop of the second year. If any are permitted to remain, it is only upon a few of the strongest plants, and then usually only a single stem or blossom is saved as a sample, though usually the largest specimen berries cannot be obtained except from plants that have been set out at least six or eight months. In gardens where the fruit is wanted, the blossoms may be left on all except the smallest plants; but if planted late in April, or in May or June, the grower will do much better to cut off all except an occasional fruit stem.

Cultivation.—Strawberries should be hoed or cultivated *at least* three times the first year: once in May, once in July, and again in August. If it can be done every two or three weeks, from early in April until October, then a much stronger growth can be obtained. In the end, it is about as easy to cultivate or hoe the ground *frequently* as to do it only a few times in the season, as more weeds can usually be killed in an hour, when they are only quarter of an inch high, than in three hours when six inches high and wedged in among the plants. When the hoe or pronged hoe is used, the soil should at times be loosened or stirred

to a depth of from four to six inches, except close in among the roots, when an inch or two in depth is sufficient. The use of a small plow is also of great advantage in keeping the soil well stirred. Even in the "hill system" the ground should be kept level, not hilled up around the plants.

When using the "matted row" system, the cultivator should always be run in the same direction, after the runners appear, one or two paths north, and the next one or two towards the south, etc., and should be narrowed each succeeding time as the plants spread, until only a path a foot wide is left. A solid bed of plants, three or four feet wide, will thus be formed quicker and easier than if the young plants are disturbed by pulling round the runners in opposite directions. When following the "matted hill" system, it is also well to drive always in the same direction for the same paths after the runners appear, and to narrow the cultivator as the "matted hill" becomes larger.

Watering in a Drouth.—One good watering, once or twice a week, in the morning or evening, is better than ten times as often if improperly done. The proper way to do is to draw away a little of the soil from one side, or from around the plant, and allow a pint or more of water to soak in around the roots. Afterwards replace the dry soil that was removed, and there will be no complaints about the ground baking, while the soil underneath will keep moist for some days longer, on account of the mulching of dry loose earth on top. A slight watering on the surface often seems to have the effect of burning up or dwarfing the plants. Old fruit or tomato cans, with a small hole in the bottom, and sunk a little ways into the soil at one side of the plant, and filled occasionally with water, are excellent for giving a steady supply of moisture.

Mulching Strawberries.—This should be done a month or two before the time of fruiting, in order to keep the green and ripe berries from being spattered with sand or mud during rain storms. It also assists in retaining moisture in the soil, and, consequently, in obtaining much larger berries. Any refuse material will answer, such as cut grass, marsh hay, straw, cornstalks, sorghum, coarse manure, pine needles, leaf mould, leaves, etc. To be of any special benefit the mulching should be applied at least two inches thick and one foot wide on each side of the plants, while it is better, if possible, to have it twice as thick and wider. Tan-bark or saw-dust (if rotted) can be used, but should be gathered up after the fruiting season, unless on clayey soils. Boards with or without other mulching, are excellent for keeping the soils moist, and also from getting hardened during the picking season. At the extreme south the mulching should be placed around the plants earlier in the season, and kept on during the summer, changing it from one path to another, if any cultivation is performed. If a few young plants are wanted, then the runners may be allowed to take root in an occasional vacant path.

Growing Large Berries.—Much, of course, depends upon the variety; but, having selected the right kinds, it is not difficult to improve greatly over the ordinary ways followed. Apply well-rotted barnyard manure from one to three inches thick, and have the ground spaded or plowed deeply—even twelve or eighteen inches if the soil is good, and in a way to mix thoroughly the manure with the soil. A quart or two of bone-dust or other fertilizer to each square rod may afterwards be spread broadcast, and mixed six inches down, but it is not necessary. Cultivate or hoe frequently during the spring and summer, keeping the runners closely cut. Give winter protection, and hoe or dig the ground three or four inches deep previous to time of blossoming in spring. In May, mulch the plants well, and a rich reward will duly appear. Extra-sized berries can also be often obtained by removing one-fourth or one-half of the fruit stems to each plant, and clipping out a number of the inferior berries on each stalk. Old fruit cans, arranged to let the water out slowly, will help to swell the fruit to large proportions, if placed near the plants, and frequently filled with water. Half a

teaspoonful of ammonia (hartshorn) may be added with benefit to each quart of water when watering. If, in November, the ground *between* the plants is covered thickly with rotted manure, before giving winter protection, it will greatly add to the quantity and size of the berries. Thinning out the fruit stalks or berries is seldom practiced.

Winter Protection.—In the fall, just before the ground commences to freeze, or within two or three weeks afterwards, strawberry plants should be mulched or covered with some coarse material, to prevent them from alternate freezing and thawing during the winter or spring. Rye or wheat straw, or coarse manure, is most generally applied for this purpose, spreading about one inch thick. In the latitude of New Jersey a cheap and excellent covering for narrow rows is from one to three inches of soil. Evergreen boughs, pine needles, salt or marsh hay, or other coarse material that will not pack closely and smother the plants, are all good. A mulching of corn-stalks, placed crosswise, will answer. If the ground is first covered with rotted manure, great benefit will usually be obtained. It may be lightly dug under in spring. Leaves sometimes smother the plants. Many persons use them, however, adding an inch of soil to keep them in place. Scattered thinly over matted rows, and with a *very little* soil scattered here and there over them, is a better way to employ them. If the mulching material of straw, etc., is applied at the commencement of a rain or snow storm, it will seldom need any poles to keep it from blowing off. Another method of mulching is to sow oats thickly over the beds about September 1, and allow the straw to fall down and cover the plants. Most growers allow the mulch of coarse manure, straw, salt hay, or pine needles to be left on until after fruiting, merely removing the mulch from over the crown of the plants in the spring, if too thick. Coarse manure becomes bleached by that time, and is sufficiently clean. In removing the mulch, wait until about the time that the ground ceases to freeze and thaw.

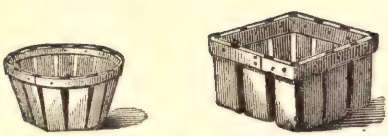
Cultivation the Second Year.—When the time can be given, we prefer to have the mulching removed, early in April, from all except the matted rows. If plants are covered with leaves, soil, corn-stalks, or evergreen boughs, it must, of course, be done. After hoeing or spading the ground from two to three inches deep, it may be again placed around the plants and in the paths. The soil should not be disturbed while very wet, nor after the plants are in blossom. The paths between the matted rows may also be spaded at this time, and be mulched again some weeks before fruiting. Though we consider it to be an advantage to give shallow cultivation early in the spring, yet, if entirely dispensed with, good crops may still be obtained.

Treatment of Plants after Fruiting.—Plants grown in "matted rows" are usually allowed to bear only one crop, and are then plowed under, and the ground at once planted with tomatoes or winter cabbages, or sown with turnip seed, sweet corn, buckwheat, or other grain. When this is the custom, a new plot of strawberries is made each spring. Sometimes, when the weeds are not very bad, the beds may be cleaned up, and the paths spaded or plowed, and occasionally cultivated during the season. A top-dressing of fine manure, bonedust, or other fertilizer, should be given in such cases. Another way is to mow down all except a narrow strip in each matted row, rake off the foliage, and plow or spade up all except the strips that have been left—first manuring the ground if possible. New runners will soon appear, and, by using the cultivator, as in the preceding year, new "matted rows" will be formed.

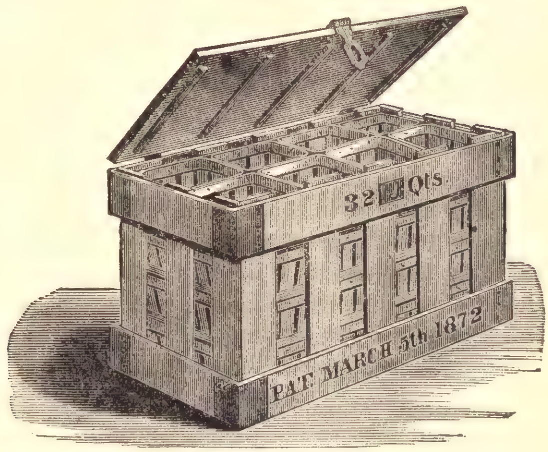
Old beds grown by the "hill system" are more easily managed. Apply manure or fertilizers, plow or spade up the soil, hoe out the weeds, and loosen the soil in among the plants. Cultivate afterwards the same as the first year. I do not recommend cutting off the foliage, except in wet seasons; however, if the plants, or the south half of each plant, are left, a partial shade will yet remain. An inch or two of fresh soil from the paths or elsewhere, is

a decided benefit if placed around the plants. By filling up the plants each fall with an inch or two of manure, and by cleaning out the beds immediately after fruiting, plants grown "in hills" and given good cultivation, will often give fine crops for from three to six years. "Matted hills" may be renewed by spading or plowing up all except one corner or the center of each hill. Beds growing broadcast can be made to produce good crops, by spading up all except narrow strips of the youngest plants, and by working in plenty of fine manure, or hen manure, etc., among the plants. As plants "run out," or usually lose their vigor after being planted in the same place for three or four years, it is best to obtain a fresh supply from outside or distant parties every few years.

To Hasten the Time of Ripening.—Early berries generally bring the best prices. If early varieties are planted on the south side of a thick hedge, or of a close fence or wall, it is possible to get fruit some days earlier than otherwise. The southern slopes of a hill, or of an artificial ridge made two or three feet high, are also favorable. If planted on northern slopes, or in thickly matted rows, or on clay soils, their time of ripening can be retarded. On light or sandy soils, if not too rich, they will ripen early, whether "in hills" or "matted rows." A few quarts of early berries may be obtained by placing a hot-bed frame and glass over some early variety in the garden. This should be done very early in spring, or at the close of winter, if tried. Keep well covered with old carpets, straw, or matting when the nights are cold. Give air on warm days. Even without the glass, by covering the frame at night, early berries may be obtained. Strawberries at the North usually do best where fully exposed to the sun, but good crops can also be obtained in orchards where the shade is not too thick. Good drainage, either natural or artificial, is especially important at the South, to prevent the soil from baking too hard, and the plants from burning up.



FRUIT BASKETS.



FRUIT CRATE.

Ripening or Coloring Berries.—Occasionally it is desired to color berries that, from some cause, have only partially colored. The simplest plan is to support the fruit stalks four inches above ground by means of a stout wire. The ends of the wire may be driven into the ground, while the rest of the wire may be bent to fit half around the plant and to support the fruit. Barrel hoops or other materials may also be used to raise the berries from the ground, and thus to give them sunlight.

Picking and Marketing.—Strawberries will keep in much better condition, and sell at higher figures if carefully picked with half an inch of the stem attached. The stem and hulls allow the air to circulate more freely among the berries. In packing for market the berries are usually put in quart baskets that are packed in thirty-two quart well-ventilated

crates. Pint baskets are sometimes used for marketing berries, but less commonly than those holding a quart.

Yield and Profits.—From two hundred to four hundred bushels of strawberries are sometimes obtained from an acre, although a more common yield is from fifty to one hundred bushels per acre. The total cost of plants, cultivation, picking, etc., is usually from $75 to $100 per acre. The writer knows of a case in which $110 worth of Jucunda berries were sold from one-eighth of an acre, and another in which a crop of Boydens was sold at the rate of over $1,500 per acre. Two ladies in Centralia, Ill., are said to have raised and sold nearly $850 worth of berries from an acre and a quarter of land. A gentleman in New Jersey not long since raised one hundred and fifty bushels of berries from half an acre of land and sold them for $500.

Mr. William H. Earle of Mass., says: "If one takes interest in the business of strawberry culture he will be surprised at the possible results. On about three acres of land I realized a gross income of a little over two thousand dollars."

The owner of a plantation of twenty-five acres devoted to strawberry culture, near Norfolk, Virginia, says: "My twenty-five acres would produce 3,000 crates. Half of these," said he, "are lost by bad picking, neglect, or stealing. We will only count on 1,500 crates sure, as coming from that amount of land. Each crate holds sixty quarts, which we sell at ten cents a quart to retailers and commission agents in other cities. We get back in money from the produce of that many acres the sum of $9,000. This is an actual average."

The above results may not be the common average of growers of this fruit, but they show what may be accomplished with suitable care and other favoring conditions.

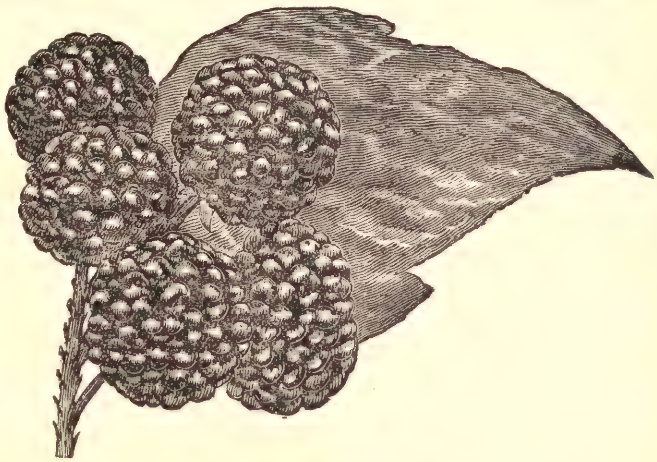
Diseases and Insect Enemies.—The rust or leaf blight sometimes attacks the strawberry plant. The grubs are also occasionally very destructive by feeding upon the roots, causing the plants to wither and die. Common salt sown broadcast at the rate of three or four bushels to the acre, or well mixed with the soil a week or two before planting will sometimes eradicate them. The same quantity applied about the roots in liquid form might hasten the effect in time of drouth. Another method is to dip the roots of the plant in Paris Green at the time of planting. Soot, wood ashes, muriate of potash, or land plaster are also highly recommended, but the ashes and potash should be sowed with caution in a sandy soil. The strawberry worm is also very troublesome in some sections of the country, feeding upon the leaves, which causes them to shrivel or curl and to dry up. Paris Green applied the same as for the Colorado beetle in potato culture, once a week for three or four weeks before the berries are set, will eradicate it. The solution should be made of one or two teaspoonfuls of the powder to two or three gallons of water. It should never be used when berries are in the vines, as it is a deadly poison.

Raspberries.—The raspberry is found growing wild in a large portion of both the Eastern and Western Continents, but when cultivated, the fruit is much larger than that of the wild growth, and the plants are also much more productive. New kinds have also been obtained by hybridization and from the seed, which, together with the advantages obtained from careful cultivation, have resulted in producing very fine varieties of this delicious and popular fruit. The European and Asiatic varieties (*Rubus idæus*) are of an upright habit of growth, with bristles on the canes, which are mostly straight, and produce plants from sprouts coming from the roots. They may also be propagated by planting root-cuttings. The American Red varieties (*Rubus strigosus*) are thought by many to be a variety of the same species, being of similar habits of growth, and also propagated from suckers. The black varieties belong to the *Rubus occidentalis* species. A few of the yellow and red varieties that are propagated by the tips of the canes taking root in the soil are also closely allied to this class.

The *Rubus strigosus* species frequently send up suckers so abundantly as to become troublesome, filling the ground with young canes, which crowd the bearing plants and injure the

SOUHEGAN RASPBERRY.

crop of fruit. When scarce, varieties of this species may be rapidly increased by cutting the roots in pieces of one or two inches in length, and planting in an ordinary hot-bed, or under glass, until the canes are a few inches in height, when they may be transplanted in rows to form a new plantation. As the *Rubus occidentalis* forms new plants by the tips of its canes taking root in the ground, during the latter part of summer, when the soil is usually dry and hard, the tender tops cannot readily take hold without assistance, while the wind moving them back and forward in the hard ground will soon be liable to destroy their vitality. It will therefore be necessary for the cultivator of such varieties to go over the ground frequently during the season, and with a trowel cover the tips of the best canes with soil, where they will soon take root and form new plants, which can be taken up and transplanted in the fall or following spring. The varieties of this species are generally very hardy, and able to withstand the extremes of heat and cold better than most others. The raspberry is very easily cultivated, hence there is no reason why the family of every farmer should not have an abundance of this delicious and healthful fruit in its season, while raspberry jam, syrups, preserves, tarts, ices, and jellies are relished at other seasons of the year in every household, and add much to the variety and luxury of the table.



GREGG RASPBERRY.

Varieties.—There are numerous varieties of raspberries, and new ones are constantly being introduced. There are some that are more hardy than others, some being alike sensitive to the cold of the severe winters at the North and the burning sun at the South, while others thrive well in either extreme of climate. Among some of the best red varieties are the Cuthbert, Reliance, Brandywine, Turner, Shaffer, Superb, Herstine, and Queen of the Market. Among the standard black caps we have the Gregg, Mammoth Cluster, Davidson's Thornless, Doolittle, Souhegan, etc. Brinkle's Orange, Canada Yellow, Caroline, and the Florence are fine yellow varieties.

THE CUTHBERT.

Cuthbert.—This has proved one of the best and most reliable red raspberries in cultivation, having given excellent satisfaction throughout the country, even in the far North. The plant is quite prolific, vigorous, and hardy, fruit large, deep red, and fine flavored. It is said that berries of this variety have been grown measuring three inches in circumference. Being quite firm, it stands

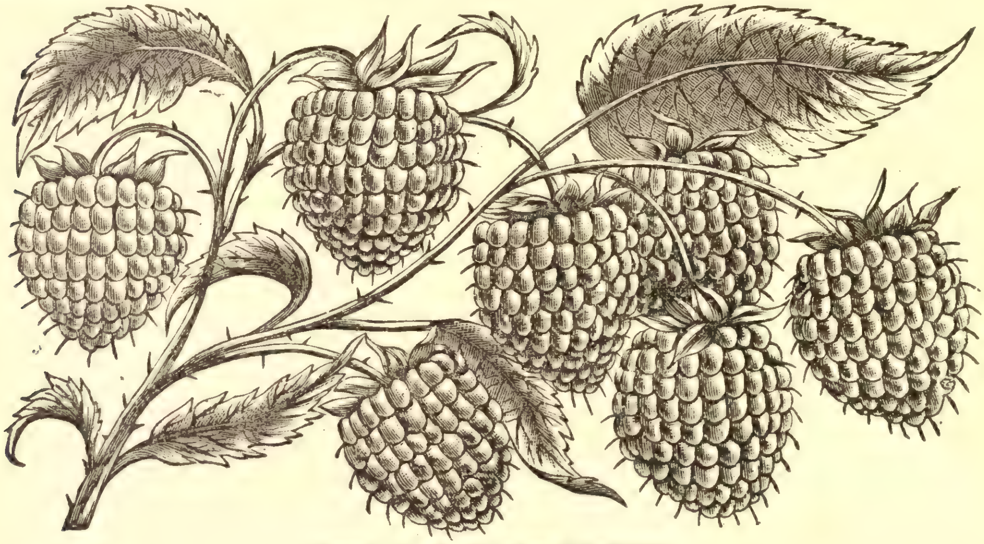
transportation well, being fully equal in this respect to the Brandywine. Season medium, till quite late. The cut of this variety, and that of the Herstine, Queen of the Market, and Gregg, were made from photographs of fruit grown by Mr. Wm. Parry, of Cinnaminson, N. J.

Reliance.—This is a seedling raised from the Philadelphia; the plants are very productive, hardy, and make but few suckers. It is an excellent variety, either for home use or the market. The fruit is of dark red or crimson, large, and of good quality.

Brandywine.—An old and reliable market variety. The plants are very productive, and endure well the extremes of heat and cold, requiring winter protection only in the very coldest localities, while it endures the drouth of the South better than most varieties. It ripens moderately early, and is one of the best to endure shipment for long distances. Berries of good quality, firm flesh, and bright red color.

Shaffer.—The plants and fruit of this variety both attain a large and vigorous growth; color a dull, brownish red; sprightly sub-acid flavor that renders it of especial value for canning purposes.

Superb.—A seedling of the old and once popular variety, the Philadelphia. This is a very prolific berry, a strong and vigorous grower, fruit large, rich crimson in color, spicy flavor, and one of the earliest to ripen.



QUEEN OF THE MARKET RASPBERRY.

The Gregg is one of the very best of the black varieties. It originated in Indiana. The plant is a strong grower, prolific and hardy. The berries are large, color deep black, with a decided flavor. It is one of the most popular varieties for home use or late market.

Herstine.—A large, half hardy, red raspberry; a good grower; abundant and early bearer; suckers moderate; canes strong, covered with a white bloom; foliage healthy, of medium size; fruit oblong, with small grains, and bright crimson color; flavor sub-acid and very good. It thrives well in sections where the winters are not very severe.

Queen of the Market.—A variety similar in many respects to the Cuthbert, being vigorous, hardy, and productive, with more than the average amount of firmness of flesh, while it is of very fair quality.

Souhegan.—This variety originated in Hillsboro Co., N. H., and is exceedingly productive, the berries growing in clusters, as will be seen by the cut of it, which represents a branch of that fruit grown by Messrs. G. H. and J. H. Hale of South Glastonbury, Conn. The canes are quite vigorous, branching freely, and have many strong, sharp spires, while it

is one of the hardiest varieties known. The fruit is of good quality, large size, jet black in color, and ripens among the earliest, which is at the time when strawberries are getting scarce in the market.

Brinkle's Orange.—A variety of excellent quality; fruit large, fine flavored, and light yellow in color. The plant is a good grower, but not hardy, and must have winter protection at the North.

Carolinas.—This is a seedling of Brinkle's Orange, to which it bears a close resemblance in appearance and quality. The plant is, however, quite hardy.

Soil.—Raspberries may be grown on almost any soil that will produce a good crop of corn or potatoes. Care should be used, however, to avoid very heavy clay soils, and such as are liable to remain water-soaked during the winter. The black varieties are more hardy than the red, and good crops—but not the best—may be grown on even hard clay or wet soils. A rich, gravelly soil, or a moist loam of good quality, are perhaps the best for this fruit, while fine crops may also be produced from a deep sandy loam. The berries will ripen several days earlier on the latter soil than upon any other. It is always best, when practicable, to select such soils as are adapted to the plants, as the most satisfactory results are thus obtained.

Manures and Fertilizers.—Well fermented stable manure is perhaps the best for general use in raspberry culture, although there are many other fertilizers that will answer the purpose well. Decomposed sod and muck are both excellent, and especially if left exposed to the action of the frost in a barnyard during the winter. Bone dust, guano, or hen manure may be applied at the rate of from five hundred to eight hundred pounds per acre, with benefit, either broadcast and harrowed in, or placed on the surface before hoeing or cultivating. Wood ashes, leaf mould, or soil from the woods, and salt, are also good; the latter should be applied in quantity from one and a half to three bushels per acre. On very rich soil, such as the prairies of the West, ground bone and wood ashes will prove very beneficial.

Planting.—Land that has previously been occupied by hoed crops, or grain, is more desirable for planting raspberries, it being more easily worked, although they may be grown quite successfully on sod land after the sod has been turned under. Keep the roots moist while setting, taking pains not to allow the hot sun to dry and wither them. For *field culture* the rows may be from six to eight feet apart, with plants two or three feet apart in the rows. In *garden culture*, they may be planted at the same distance, or in hills about four feet apart each way, and one or two plants in a hill. Some place the thrifty growing cap varieties at five feet apart. In planting for field culture the usual custom is to turn a furrow with a plow for setting. Place the plants in at about the same depth of soil they previously occupied, and cover the roots with a hoe or small plow. When a spade is used for planting, make the excavation for the roots sufficiently large to allow them to spread out well. Unless the ground is quite wet, press the soil a little with the foot in setting, just before filling in the last inch or two of depth.

This will aid the roots in retaining the moisture of the soil, and also the plants in maintaining a secure upright position. If it is very warm at the time of planting, and the canes are in leaf, the plants may require shading for a few days; otherwise they will not. Many fruit growers consider it beneficial to cut off the canes within from two to six inches of the ground after setting, in order to give them a more vigorous start when planting in the spring. This is not desirable when planting in the fall. The usual time for planting raspberries and blackberries is during the month of October or early November; this gives the roots a chance to grow before the ground freezes, which they will do even when the tops are dormant. Red raspberries will remain in prime bearing condition from six to eight years, with good care, until they will frequently contrive to yield fair crops from fifteen to twenty years.

Planting at the South.—In planting raspberries at the extreme South, light sandy loams should be avoided, unless there is a clayey sub-soil within two or three feet of the surface, to aid in retaining moisture. If the soil be light and sandy, and the sub-soil of a leachey nature, the plants would be liable to dry up for lack of moisture. Almost all of the black caps, and many of the red and yellow varieties of the same family thrive well at the South; a few, however, such as the Highland Hardy, Pride of the Hudson, etc., require a colder climate.

Cultivation.—The soil should be kept loose, friable, and free from weeds by the use of a cultivator or occasional shallow plowing, during the spring and summer, except perhaps a short time before and during the fruiting season. This is especially necessary in the cultivation of young growing plants. When grown in hills, allow but from three to five of the best canes to remain in each hill, hoeing or cutting out all others. If grown in rows, keep the rows narrow by hoeing out part of the young suckers.

Mulching.—A mulching in the spring, or before or during the fruiting season is very beneficial in some portions of the country, especially at the South, or at the North, wherever the planting is on a dry soil, or in a dry season, as this prevents the plants from drying up, and thus secures a larger crop of better berries. Any coarse material will answer the purpose, such as straw, coarse hay, sorghum, corn-stalks, coarse manure, pine needles, leaf mold, etc. The mulching should be applied from two to four inches thick, and two feet wide on each side of the plants. Plants that are well mulched will have a good amount of root moisture, and will also require but little cultivation, as the mulching smothers the weeds, and keeps the soil friable. When practiced at the South, the mulching should be applied in April or May, and kept on during the summer, leaving three or four inches of space around the plants in spring for the growth of the new canes. Mulching is very essential during the first season of planting at the South; otherwise plants are very liable to dry up and die for lack of moisture, being more tender when first starting in the soil.

Staking.—The following methods of staking and pruning raspberries are recommended by Mr. R. H. Haines of New Jersey, who is an excellent authority on all matters pertaining to the culture of fruits: Though stakes are not required if the "pinching-in" process is followed, yet, in garden culture, they are sometimes used by those who wish their plants to grow close together. One way, that is usually followed, is to drive a stake down in each hill, and tie the canes to it. Another method is to drive down two stakes, one on each side of a hill, and nail a barrel hoop to them, thus enclosing the canes. Another method is to drive down a stake every ten or twenty feet, and stretch one or two wires on them at a distance of from three to four feet from the ground. A fourth plan is to nail a wooden strip to the tops of stakes, at a height of three or four feet from the ground, with another strip lower down when desired. Any of these plans can be followed with very little trouble and at slight cost; but when summer pruning is practiced, or when plants are grown in continuous rows, and cut off at from three to three and a half feet from the ground, the stakes are entirely unnecessary, and especially if the plants are well mulched, as the mulching will keep the fruit from coming into contact with the ground, and from becoming soiled.

Summer Pruning.—The first season only two or three raspberry shoots or canes should be allowed to grow up from each hill; any others should be hoed down the same as weeds, where fruit is the object. In June, July, and August, or as soon as the canes reach a height of from two to three feet, the tops should be pinched off or broken off with the thumb and finger. The more vigorous shoots may be allowed to grow to even three feet in height, if desired. If this summer pruning should be neglected the first year until the canes have grown quite tall, then it is probably best not to cut them back quite so far. A knife or shears will sometimes be required where there is much of a growth to be taken off.

RELIANCE RASPBERRY.

[Copied from photograph of fruit grown by R. H. Haines, Moorestown, N. J.]

This pinching off of the canes causes them to send out lateral shoots, so that nearly double the crop can be obtained by it. Where these lateral shoots have made a growth of a foot from the canes, they can be pinched off, causing them to put out new laterals. This second heading back may be deferred until early in spring, when desired. When treated in this way the plants become quite strong and stocky, and are enabled to withstand ordinary winds, and to hold up their fruit without the assistance of stakes. After the first year, raspberries need not be pinched off until the canes are from three to three and a half feet high. Some of the laterals, growing nearly upright, afterwards give a height to the plants of from four to five feet.

THE HERSTINE.

Winter Pruning.—South of Virginia, this may be performed at almost any time during the winter, but where the cold is severe it is well to defer it until the winter has passed. All the old canes, or such as had fruit upon them, should be cut out at this pruning, as fruit is only produced on raspberry or blackberry canes of the previous year's growth. With a pair of pruning shears and thick gloves, this part can be easily done; or a short briar hook on a long handle can be used.

Some persons make a practice of cutting out the old canes in July or August, immediately after the fruiting season, but I do not consider it to be advisable, as cutting away so much foliage is liable to check the growth of the young canes; while, if left, they are also quite a help in assisting the plants to withstand winter winds. In districts where half-hardy varieties require winter protection, the old canes can be cut out, and the others pruned in

October or November, just previous to covering them. However, in gardens where it is desired to keep the plants trim and neat, or where winter winds are not feared, then the old canes may be cut out at almost any time without serious injury to the plants.

In pruning the bearing canes in spring, the laterals should be cut back to within about a foot of the main stems, or when the tips are frozen, to a point back of where they have been winter-killed. The frozen canes are usually of a different color from the rest of the wood. Frequently I have had my plants pruned as late as the middle of April, waiting three or four days after the buds have opened, and then pruning off the branches just beyond a strong bud. At this pruning any surplus canes may be cut out, if not hoed out the previous year when small.

In hill culture, from three to five canes will usually give more and better fruit than if a larger number are allowed to grow. Even when grown in rows, it is best to keep the rows quite narrow, not over a foot and a half or two feet wide near the ground; cutting off or hoeing down all canes coming up in the paths.

Winter Protection. — In localities where the winters are very severe, it is well to give protection to raspberry vines, to prevent them from winter-killing. Some varieties will do well without this care, but most of the best varieties will do enough better to pay for the trouble. The usual and best method is to bend the canes down upon the ground, and throw a shovelful of earth upon the tops to keep them in place; then plow a furrow each side the row to afford a covering of three or four inches of soil. In the spring the canes can be loosened up with a fork; this should not, however, be done until all danger of frost is passed. Other methods are practiced, such as binding the canes to the ground and covering them with pine boughs, or to tie them to a stake and bind straw around them; but the best is that first recommended, since it affords a secure protection with the least labor, and obviates the leaving of refuse material to furnish a harbor for mice during the winter, or the scattering of waste material about to be cleaned off in the spring. The canes may be pruned in the fall, instead of the following spring, if desired. In giving winter protection by this means they will then require less covering. In protecting plants set in the fall, many growers throw a forkful of manure over each plant, instead of soil, allowing it to remain until spring, when it is mixed with the soil by the use of a light harrow. This furnishes warmth, besides fertilizing the plants for the next season's growth.

Cultivation after the First Season. — As soon as the weeds commence growing in the spring, shallow plowing should be given between the rows, if the ground is suitable. If the plowing is so deep as to tear the roots, injury is done; and, as the roots extend near the surface of the ground, care should be exercised in this respect. The weeds and refuse matter should then be carefully wed out from among the plants, and either carried off the land or put in the furrows and covered with soil. Cultivation should be given sufficiently often to keep the earth loose and friable, and the weeds exterminated. When the plants are in blossom, no further cultivation should be given until after the fruit is picked.

How to Obtain a Crop of Raspberries in the Fall. — This is done by selecting some late-bearing variety, and cutting off all the canes early in the spring, at from four to six inches from the ground, and giving good cultivation or mulching during the spring and summer. Leave only the strongest of the new shoots that come up for bearing, and these will give a fine crop of berries in the autumn, at the season when they will bring a large price in the market. A smaller crop can be obtained also in the usual season for this fruit by simply permitting the plants to grow naturally, like other raspberries, thinning out the smaller canes when too thick for a vigorous growth.

Yield and Profits. — With good care, raspberries may be made a very profitable crop. The average yield of the red varieties will range from fifty to sixty bushels per acre.

The black caps are somewhat more productive, and will yield from fifty to a hundred and fifty bushels to the acre, although both the red and black varieties have been known to produce much larger crops than these.

Rust. — This is the principal disease with which the raspberry plant is affected, and is characterized by a bright golden or orange red fungus that forms on the under sides of the leaves, causing them to curl up and wither. Sometimes it turns black after assuming the above-mentioned color. Such plants soon lose their vigor, and fail in the fruiting season. This disease, unless soon exterminated, will rapidly extend throughout the whole plantation; hence the best method is to dig up all plants thus affected, and burn them, root and branch. This should be done when the leaves are wet with dew or rain, so as to prevent the dust from being scattered upon other plants, and the disease thus spread. The application of wood ashes, salt, and lime, scattered around the plants, is said to be a good remedy, but too large a quantity of either of the last two would be liable to kill the plants.

Blackberries. — Like the raspberry, the blackberry grows wild in a large portion of both hemispheres, and is also becoming quite extensively cultivated for home use and market. The plants are very hardy, vigorous growers. The fruit ripens at the close of the raspberry season, and before the appearance of peaches and grapes. It holds an important position among the small fruits, bringing a high price in the market, while its rich, pleasant flavor makes it a favorite with everyone. Some of the finer varieties are very large, being from an inch to an inch and a half or more in length. Blackberry plantations that are propagated from the cuttings of healthy young shoots will, with good care, continue to yield good crops from twelve to fifteen years, or even longer.

WILSON, JR.

Varieties. — There are several varieties of blackberries, although the number at present cultivated does not perhaps equal those of the raspberry. Most of the valuable varieties in cultivation have been found growing wild, and were selected and saved on account of their superiority over others. From the thousands of seedlings that have been produced, but few, if any, have yet proved superior to the original plants. This may perhaps be due to the fact that less care and attention has as yet been bestowed upon this fruit, than upon some others, such as the strawberry and the grape. Although we have some very fine varieties at present in cultivation, doubtless those that are greatly superior could be produced by careful painstaking in propagating by hybridizing, and from seedlings. Some of the best varieties at present cultivated are WILSON'S EARLY, DORCHESTER, KITTATINY, SNYDER, TAYLOR'S PROLIFIC, WACHUSETT THORNLESS, and WILSON, JR. The cuts of the three varieties of blackberries which we insert represent fruit grown by Mr. Wm. Parry, of Cinnaminson, N. J. The WILSON, JR., is a seedling from the Early Wilson, to which it bears a close resemblance.

Planting and Cultivation. — The general cultivation of blackberries is similar to that of raspberries, with but few exceptions. They require soil that is less rich than the raspberry, and the plants, being more vigorous growers, require more room. They need but one planting, as the canes send up a spontaneous growth of suckers annually, thus renewing themselves for fruit growth the following year. If planted on soil that is too rich, there will be a luxuriant growth of vines, but a sparse growth of fruit. Mr. Wm. Parry gives the following statement with reference to his experience with this fruit: "We planted ten acres

of blackberries on thin, sandy land, which bore good crops of fruit for thirteen years, yielding several times 650, 700, and once 800 bushels of fruit, while land adjoining, equally good, planted with corn, did not produce more than half that number of bushels per acre. When the corn was removed, all was gone; to get another crop we had to manure and plant again. But not so with the blackberries, for we pick only the ripe fruit, and leave the foliage to fall upon the ground to add to its fertility. The plants being once established, the annual crop of fruit taken off may be compared to the coupons taken from government bonds, the principal remaining to produce more.

Having experimented on several kinds of soil, from a firm clay to a light blowing sand, we prefer, as the most favorable location for blackberries, a light, moist, sandy loam; well underdrained, if water would otherwise stand near the surface. Formerly we thought that low, rich land would be best, judging from the large growth of briers along the ditches and swampy places. Accordingly one of our neighbors planted ten acres of low, dark, rich land that had produced heavy crops of corn and timothy, expecting to get a corresponding one of blackberries; but in this he was disappointed, except in growth of canes, which were very large and strong, but not well ripened before winter set in, and consequently were greatly injured, and sometimes entirely killed before spring, and yielding but little or no fruit; while blackberries planted on thin, higher land, not worth near so much for agricultural purposes, produced small canes with buds well developed and wood matured before the approach of winter, and yielded heavy crops of fruit.

WILSON'S EARLY BLACKBERRY.

The land should be plowed and harrowed smoothly, then open furrows in the fall at a distance of eight feet apart; and if muck can be had conveniently, it is valuable to spread along the furrows during winter, leaving it exposed to the action of the frost. Early in spring set the plants nearly three feet apart, requiring 2,000 plants to one acre. The intervening space, while the plants are small, need not be lost, but corn, potatoes, or other vegetables may be grown midway between the rows for the first year or two. The roots will mostly follow along the muck, and grow more vigorously than lateral or side shoots. Hence the strongest and best plants will come up nearly where they are wanted, to produce fruit the following year. But they should not be left to stand along the rows closer together than an average of one plant to a foot in length in the rows.

The plantation should be gone over several times during the summer, and the tops of the young canes, as they appear above the bearing bushes, should be shortened in so as to keep them at a uniform height of about three to five feet, according to their strength. This will induce the side branches to grow vigorously and develop fruit buds near the ground, and by interlocking with each other the bushes will support themselves, and thus avoid the necessity of stakes and wires to prevent high winds from injuring the tender canes.

The side branches should be shortened in during the following winter or spring to a pyramidal form somewhat resembling a dwarf pear tree when properly trimmed. Plants thus treated will yield more fruit and of a better quality than if left to grow tall and slender, as by nature they are inclined to do. We have sometimes left a few rows without pruning, and others pruned but little, which fully illustrated the great importance of shortening in the branches. The unpruned bushes will bear more fruit than could be ripened on them; it would remain red a long time, and finally dry up, being of no value. The best and earliest fruit would be on the bushes well pruned, so as to throw the whole strength of the roots into fewer berries. To insure good crops requires close attention; the canes should be kept thin and well headed back. On poor land an occasional dressing of manure, muck, or fertilizers of some kind adds to the quantity and quality of the fruit. The best results are obtained from young healthy plants grown from root cuttings especially for the purpose, while suckers from old and decayed patches yield but little profit.

KITTATINNY BLACKBERRY.

Winter Protection.—Some varieties of blackberries are sufficiently hardy to withstand the cold climate of Canada, and the extreme northern portion of New England without protection; others will be liable to winter-kill unless some protection is given. Severe pruning in summer renders the plants more hardy; it is best to omit (after the second year), all cultivation in summer after the time of blossoming. The surface of the ground should be stirred often to keep the weeds down, but not too deeply, for if the roots are broken, there will be a great number of new suckers sent up, which soon crowd the others. When covering of the canes is desired for winter protection, they can be more easily bent over to be covered with soil, if the earth is dug away a little from one side of the plant.

Yield and Profit.—The yield and profit of blackberries will of course vary with the season, market price, etc., like that of other fruit crops, but with good management the growing of this fruit may be made very profitable. An extensive cultivator of this fruit

says: "We have known some plantations to yield annually $400 per acre and upwards, for several years in succession, while others did not pay more than half that amount. Having kept a record of the yield and sale of our blackberries for fourteen years past, we find the average to be about as follows, viz.: Price fourteen cents per quart, and yield 2,200 quarts per acre, which gives the following results:

Commission, at 10 per cent.,	$20.80
Picking 2,200 quarts at 1½ cents,	33.00
Use of boxes,	10.00
Pruning, cultivating, etc.,	34.20
Net profit per acre,	200.00
Gross sales 2,200 quarts per acre, at 14 cents,	$308.00

Sometimes we hear of extravagant reports, calculated from the product of a small lot up to what ten or twenty acres under similar circumstances would yield. A safer rule is to take the acres, and see what they have produced. By reference to the report of the West Jersey Fruit Growers' Association, which appointed committees to collect the returns from all the fruit growers in the neighborhood, it will be found that 776 acres of land in strawberries, raspberries, and blackberries produced the sum of nearly $200,000, or about $250 per acre." Another fruit grower of many years experience expresses the following opinion: "Requiring little manure, and being as easy grown as a field of corn, the blackberry proves one of the most profitable of fruits. The yield per acre is usually from sixty to one hundred bushels, though at times one hundred and fifty bushels have been obtained. The price in some markets averages twenty cents per quart, and in others twelve and fifteen cents. Some plantations yield fruit for from twenty to thirty years, giving an income of from $100 to $400 per acre. At times $500 worth of fruit has been obtained per acre. Berries from the South have sometimes sold in the Philadelphia and New York markets as high as fifty cents per quart. At the North, forty plants have been known to yield fully eight bushels of fruit. They will give a nice little income to children when planted along fences, even if uncultivated after the first year. When grown in a green sod they often are very hardy and quite productive."

Currants.—The currant (*Ribes rubrum*) is a native of Britain and the North of Europe, and has been cultivated in the gardens of that region for more than a century. It is one of

the most common of our small fruits, as well as the most easily grown, and has long since been regarded as a necessary part of every garden. It is often neglected and allowed to stand year after year in the sod with no care whatever, yet under these adverse circumstances, it will produce very good crops. If properly cared for, the fruit will be much larger, and more abundant than otherwise. The currant is an exceedingly hardy shrub, usually growing from three to four feet high. The original wild species produces a small and very sour fruit, but cultivation has produced great changes, and we now have varieties the single globes of which will measure an inch and a quarter or more in circumference. The Black Currant (*Ribes nigrum*), is a distinct species, and has large leaves and a coarser growth than the common red or white varieties."

FAY'S PROLIFIC.

Varieties.—There are comparatively few varieties of currants in common cultivation. The standard red varieties are FAY'S PROLIFIC, CHERRY, LA VERSAILLAISE, VICTORIA (a late variety), and RED DUTCH. The WHITE GRAPE is the best white, and the BLACK NAPLES, and LEE'S PROLIFIC the best of the black varieties. Fay's Prolific is a very hardy variety and an abundant bearer; the fruit being considerably above medium size and growing in large clusters, as is shown in the illustration of this variety, which represents fruit grown by Mr. George S. Josselyn, Fredonia, N. Y. The Black Naples is an old and very large variety. It is less acid than the red or white varieties, and has a musky flavor. Being of larger growth than these, it requires more room in setting, and less pruning than the others mentioned.

Cultivation. — The currant is propagated with the greatest ease from cuttings which should be planted in the autumn or early in the spring. They will soon take root, and should be about a foot in length when set. Currants will do well on almost any kind of soil, but the best results require a deep, rich soil. At the South, they do best in a soil containing a mixture of clay. As a general rule, the richer the soil, and the better the cultivation, the heavier the crop, and the larger the berries. Before setting the cuttings, manure and prepare the ground the same as for any ordinary crop. Set the cuttings from three to three and a half feet apart, in rows five feet apart; this will require nearly 3,000 plants per acre. Keep the ground mellow and free from grass and weeds. Mulching during fruiting time adds to the size of the fruit, and is essential in order to secure the best results at the South, where the ground becomes parched in summer. Almost any loose material will answer for mulching, except evergreen boughs.

Pruning. — With proper care and pruning, the vigor of the currant plants or shrubs may be kept up for many years. The pruning essential is the thinning out of all the old canes that show signs of failing, and in cutting back annually and thinning out the new shoots from one third to one-half. This will add much to their vigor and productiveness. Pruning may be done late in the fall or very early in the spring before the buds begin to swell. Extra large berries can be obtained by pinching off the ends of the strong growing shoots about the middle of June, or when the fruit is about two-thirds grown. This causes the plants to expend all their strength and energies in increasing the size, and maturing the fruit. The fruiting season may be prolonged by shading the bushes with straw matting or sacking before the berries commence to ripen. By this means, the full ripening of the fruit may be retarded until into September or October.

Diseases and Enemies of the Currant. — The currant has but few enemies and diseases. The most common enemy is the currant worm (*Abraxis ribearia*), that eats the leaves of the plants, and the currant borer (*Prenocerus supernatatus*), that feeds upon the pith or wood of the young shoots. For treatment, see DISEASES AND ENEMIES OF FRUIT.

Gooseberries. — The gooseberry (*Ribes grossularia*) that is cultivated in our gardens, is a native of northern Europe, the wild species growing in this country not having proved very valuable for culture. It is grown much more extensively in some portions of Europe than in this country, although it is receiving more general attention at present here, than formerly. Great improvements have been made of late in the American varieties, which may be said to constitute a new era in the culture of this valuable fruit, which is excellent for making jellies, pies, canning, and other household purposes, while it bears transportation well, when sent to market.

GOOSEBERRY.

Varieties. — The principal varieties of the gooseberry are the DOWNING, HOUGHTON'S SEEDLING, SMITH'S IMPROVED, and the AMERICAN SEEDLING. These are all hardy and productive. The cut of the Downing is a good illustration of this variety, and is copied by permission from the catalogue of Mr. R. H. Haines of Moorestown, New Jersey. Gooseberries when in a green state are in good demand in the markets, while when fully ripened they are a very delicious fruit.

Cultivation. — The gooseberry requires about the same general treatment as the currant, but rather more care, and the same directions respecting planting, growing, mulching, pruning, currant worms, etc., will apply to its culture. It is a gross feeder, and requires a rich soil, — a rich, moist loam, if not too wet, being regarded as the best. Drouth is very injurious to the plants, and for this reason heavy mulching is very beneficial. The pruning

DOWNING'S GOOSEBERRY.

should be such as to give the plants plenty of air, as mildew often results from overcrowding. The plants will not bear well for more than five or six years; the setting out of new plants every year or two is therefore to be recommended, in order to have a constant supply of young and vigorous plants for bearing. The north side of a building or fence will often prove a good location for growing this fruit, thus affording a partial shade, and resulting in the growth of larger berries.

Diseases and Enemies. — The mildew is the most common disease to be met in the cultivation of the gooseberry, while the currant worm is the principal enemy. (See Diseases and Enemies of Fruit.)

Cranberries. — The cranberry is a semi-aquatic plant found growing wild in swampy, sandy meadows in the northern portion of both the Eastern and Western hemispheres. The American species is much larger and finer than the European, which is greatly inferior to the former, both in size and quality. The cranberry is highly valued for its fruit, which is quite acid, and is useful in making tarts, preserves, and for other culinary purposes. In many portions of New England, New Jersey, on Long Island, and other sections of the country, low, marshy meadows of but little value have been drained and made to bring very profitable returns by utilizing them for the cultivation of this fruit. From the Northwest, especially in Michigan, Wisconsin, Minnesota, and Northern Indiana, there are vast tracts covered with cranberry vines growing wild. By cultivation, this fruit has become greatly improved in size, quality, and productiveness, and in many portions of the country has become an important and profitable industry. Although the cranberry thrives best on land that is covered by water a portion of the year, yet there are some varieties that do fairly well on uplands where the soil is moderately dry.

Varieties. — There are but few varieties of the cranberry in cultivation. Among the best may be mentioned the Mansfield Creeper, a variety suited to upland culture, and is quite productive, with berries of good size. For lowland culture the Black Bell, a large variety, well shaped, of very dark, bright-red color; the Large Cherry, a good sized, oval variety. Besides these, there are other kinds of the common "Cherry" and "Bell" varieties that are cultivated to a considerable extent. No especial pains have yet been taken to improve varieties of this fruit on scientific principles, but no doubt great improvement could be accomplished in this direction.

Culture. — There are probably few, if any, fruits cultivated that will grow on so great a variety of soils as the cranberry. A New England writer well skilled in the culture of this fruit, says respecting it: "While it seems to be natural for the cranberry to grow on land that is very wet during the largest portion of the year, it will grow better on high land than it will where the land is wet all of the year. From the time of blossoming until the fruit is ripe it flourishes best where the ground is hot and dry. The most profitable and the best location seems to be a meadow that has a peat bottom that can be flowed with at least two feet of water during the winter and spring, and can be thoroughly drained in the summer. In such location the cranberry can be grown with as much profit as any other fruit; but if one has no meadow, and desires to have a few cranberries for his own use, it is very easy to grow them on high, dry ground; in fact, we have seen them grown at a profit on good corn land by the side of strawberries; the products of three-quarters of an acre being sold the third year after setting for $300.

The greatest trouble in growing them on high land is in keeping the ground free from weeds and grass. The vines have to be reset much oftener on high than they do on low land, but the fruit is much more valuable, being hard and thick flesh, with very small hollow cavities for the seed, and the keeping qualities are much better, oftentimes keeping more than

a year without any particular effort except to keep them in the dark and where they will not freeze. For many years we have had old cranberries in good condition when the new ones were gathered.

In setting vines on high land it is important that the roots should be set all over the ground, and not in rows, and if the land can be mulched with sawdust, leaves, or any material through which the little roots of the runners can penetrate, it will not only assist in keeping the grass out, but save the runners from being scorched by the sun. Half a rod of land in one corner of the garden, well cared for, will furnish fruit enough to supply an ordinary sized family.

If one has a pond that flows up several feet higher in the winter than in the summer, by filling in the borders with sand a good crop of cranberries can be grown for many years, without any expense after the first two or three years, except that of harvesting the fruit; in such location good crops of fruit will grow on four feet of sand, and to our knowledge will continue for more than twenty-five years without resetting.

In such locations the water protects the vines in the winter, and where it does not leave the vines until the last of May or the first of June it protects the blossom buds against the spring frosts, checks the growth of grass, and at the same time gives to the vines just the fertilizing material they require. He who desires to enter largely into the cultivation of cranberries should not be satisfied with high land, or the borders of a pond, but should look around until he finds a piece of land naturally fitted for the cranberry, and thus avoid heavy and constant expense. When such location is found, it will be a meadow with a peat bottom or never-failing stream of water flowing through it; the land so situated that it can be covered with water in a few hours at any season of the year, and kept covered at least two feet deep from December to May; also within a short distance of a sand hill.

When a piece of land of this description can be found, it is cheap at any price under five hundred dollars per acre, and even at five hundred dollars it will pay a very large profit if set with cranberries. In preparing the land, it is best to remove the sod down to the peat, which in most locations will be worth, for manure, more than the cost of removal. The land should then be covered with at least four inches of sand; this can be done best and cheapest in the winter, when the ground is frozen and the work of the men and teams is not so pressing. The vines should be set in May as soon as the weather begins to be warm; if the water can be brought to within an inch of the top of the sand, the vines can be set with greater ease, and will be much more likely to live; whatever may be said to the contrary we believe it is always best to set vines that have roots. We have seen plantations set with vines that had been run through a hay cutter, under the direction of one who believed that the tops were as good as the roots, but the result was a complete failure. The vines do best to set them in single roots, being first entirely freed from grass; the distance apart should not be over six inches each way. If the water is just the right height, the vines can be scattered over the sand and the roots pressed in with the fingers. Never set in rows two or three feet apart, for by so doing the vines will always be uneven, because by the time the ground is covered between the rows the vines in the rows become old, with many dead vines, but if the vines are set all over the ground, by the second or third year the ground will be well and evenly covered with young, vigorous vines.

There is a worm similar to the plum curculio which sometimes attacks the young fruit that grows on land that cannot be kept covered with water during the winter; as the perfect insect winters near the surface of the ground, the water probably destroys it. It is very important to keep the weeds and grass out the first two or three years; after that time, if the land is well adapted to the fruit, but little attention will be required, except to keep the land flowed at the proper time. As the weeds and grass must all be picked out by hand, the first year requires considerable time, and the second year will require more time than the crop

will be worth, but it pays in the end to keep the vines entirely free from both weeds and grass. There is a great difference in varieties, both as to the quality of the fruit and the bearing qualities of the vines; some varieties are small with thin flesh, while others are large with thick flesh, the last-named being the most desirable. No large plantation should be set without a positive certainty that the vines that are set are abundant bearers; for while some varieties produce more than three bushels to the rod, others do not produce as many quarts. If one can do so, it is always best to select vines by a personal examination when the fruit is on them, and not depend on the recommendation of any one.

Gathering.—Cranberries, when grown extensively, are generally gathered with a fine rake, or a raking machine made for the purpose, a single man being able to gather thirty bushels or more in a day, when the vines are in full bearing. Some of the berries are apt to be injured, however, by this process, by coming in contact with the teeth of the rake, but when the berries are to be used in a short time, this is no serious objection. When the berries are to be kept until the following spring or summer, they should be picked by hand, as the bruising from the rake will cause them to decay. They will then keep for months in a dark place, as cold as possible without freezing.

Mulberries.—The mulberry tree is not cultivated very extensively in this country, but it is really quite an acquisition to our summer fruits, and is well worthy a place in every garden. The fruit resembles the blackberry in appearance, but is less tart, and has less pronounced flavor. It is used the same as blackberries and raspberries are. It ripens in July, very soon after the cherry season is passed, the fruit easily dropping upon the ground when fully ripe. With some varieties the tree grows very rapidly, bearing when two years old, and often attaining a height of forty-five or fifty feet. On account of the fruit dropping as soon as ripe, a clean, short grass turf is generally kept under the trees, so that the fruit may be easily picked up uninjured. The principal varieties are the RUSSIAN, a fine hardy variety, berries sweet with sub-acid taste, and fine flavor, black or reddish white when fully ripe; the BLACK or ENGLISH variety is of slow growth that seldom attains a height of more than fifteen feet; it is, however, very long lived, specimens being found in England that are said to be 300 or more years old. The fruit is large and fine, but the tree is not as hardy as some varieties, and will not well endure the cold winters of a region north of the State of New York. The EVERBEARING originated from the seed of the Multicaulis, and is a fine, hardy variety; fruit an inch and a quarter in length, and nearly half an inch in diameter, color blue-black at full maturity. It continues bearing a long time. JOHNSON'S SEEDLING is also a fine, hardy variety.

Cultivation, etc.—The mulberry is very easily propagated from cuttings, and thrives best in a rich, sandy loam. The tree requires little or no pruning, and is easily cultivated. The cuttings are usually about three feet in length, planted about half their length in the soil in the spring.

DISEASES AND ENEMIES OF FRUIT.

IN the animal and vegetable kingdom, every creation seems to have its peculiar diseases and enemies to combat and overcome, or to be overcome thereby; thus we find that every animal and plant has its parasites, which by their depredations may so deplete the natural vigor as to induce disease and sometimes destroy life itself, while these parasites are themselves frequently subject to other parasites that prey upon their vitality in the same manner, and still the latter minute parasites have parasites of their own, and so on; thus in the great economy of Nature there is ever a tendency to maintain a balance of power, when the laws that govern it are not in any way interfered with. A large majority of the diseases of plants are caused by parasites of some kind; in fact, insect enemies and diseases are so closely connected, and their relations to each other are such, that it is often difficult for the farmer and fruit grower to determine to which source to attribute his losses.

Professor A. S. Fuller says in this connection: "Some species of insects attack only diseased or dead plants; others only the living and healthy. If a plant shows signs of failing, we are inclined to speak of it as being diseased, whether the failure is caused by a lack of some element in the soil, attacks of parasitic fungi, or noxious insects. The loss is the same in the end, whether from one or all of these enemies combined. There are two practical methods of combating insect enemies and diseases of plants; one is to cultivate so carefully and stimulate the growth of the plants that they may possess the power of resisting attack; the other is to make war directly upon them by artificial means. Of course, the first method is most applicable or practicable against the more minute species, such as plant-lice, rust, smut, and mildew. I do not recommend forcing plants to extremes, in order to enable them to resist their enemies, as this might work an irreparable injury; but the condition to be aimed at should be a healthy, vigorous growth; for anything beyond this is more the sign of weakness than strength.

The half-starved, over-worked, and uncared-for horse is sure sooner or later to become the prey of various internal and external parasites, which are thrown off, or their attacks successfully resisted by the healthy, vigorous, and well-fed animal; and the same principle holds good all through the animal and vegetable kingdom—whether the subject be a man, horse, sturdy oak, or delicate strawberry plant. Not that all diseases are due to loss of vigor through starvation and neglect; but that a large number of them are, is well known. The experience of the grape-grower of France with the Phylloxera is one of the most remarkable instances on record of the success of what may be termed the 'resistant methods' of combating insect enemies. After having searched in vain for many years to find some practical method of destroying this pest, Professor Riley in his remarkable investigations in this country discovered that some of our native American varieties were capable of resisting it, *i. e.* of growing vigorously notwithstanding the presence of the lice upon their roots. This discovery opened a way out of the difficulty, and the French are successfully availing themselves of it by using our resisting species, as stock for their more susceptible kinds. The Grape Phylloxera is more or less abundant in all of our vineyards, but owing to the rapid and vigorous growth of most of our native varieties, it does comparatively little harm. But we have many kinds of insects that attack our small fruits that cannot be controlled upon this resistant system, and we are compelled to combat them in a more direct and vigorous way."

We find that with all vegetable growths, good cultivation and such treatment as tends to promote a vigorous growth and development of the plants, has a tendency to ward off disease and enable the strong vital forces to resist the attacks of such insects as might otherwise cause serious damage. Some classes of insects may be driven away or destroyed by suitable measures, while many of the diseases may be checked, if the proper treatment is

adopted in season, while there are a few diseases the cause of which, as well as the remedies, are still unknown, notwithstanding the efforts of our most skilled naturalists in investigating to ascertain. Some of the principal diseases and enemies of the larger fruits are as follows:

Aphides.—This is the name applied to numerous insects of the family *Aphidæ* commonly known as plant lice, that live upon the leaves of fruit trees, often doing great injury, some species of this genus being very destructive, such as the hop-fly (*Aphis humuli*) and the aphis of the turnip and cabbage (*Aphis brassicæ*). The Aphides are themselves often infested by certain minute parasites, which by laying their eggs in the bodies of these insects cause the destruction of vast numbers, while these minute parasites have in their turn parasites whose eggs are deposited in their bodies, causing the death of quite a large proportion of them. Fruit trees are frequently so injured by Aphides that they are almost worthless for fruit production, these insects collecting in large numbers upon the under side of the leaves and the tender and succulent shoots, in fact there is scarcely any part of the plant that they do not attack, sometimes completely covering the leaves, buds, and tender shoots. They frequently attack cherry and plum trees in this manner, and by sucking the juice retard the growth, the leaves curl and wither, and the formation of the fruit is checked. Throwing a spray of strong soap suds over the tree with a fountain pump or large syringe or atomizer designed for such purposes, will usually prove effectual. It may be necessary to repeat this operation several times before they are all exterminated, as they increase very rapidly, and may not all be destroyed at the first application. Wood ashes thrown upon the leaves when they are wet with dew, or after a shower, will also answer the same purpose.

Apple Worm.—This worm is hatched from the eggs of the insect known as the "codling moth," (*Carpocapsa pomonella,*) and often proves quite destructive to the crop of apples and pears. The moth lays its eggs at the blossom end of the young fruit. In a short time the eggs hatch, and the worm—a reddish white—burrows its way to the core of the fruit, causing it to ripen prematurely and fall to the ground; also greatly injuring much of that which remains on the trees. After the fruit falls, the worm leaves the fruit and crawls into the crevices of the bark and hollow parts of the tree, where it spins a cocoon, where it remains until spring, when the young moth appears. The method of destroying this worm, and consequently the moth, is to permit sheep or swine and poultry to run at large in the orchards when the fruit is falling; or to have the fruit picked up each day and placed where the worms will be destroyed.

The method practiced by some is to wind a band of hay or cotton flannel cloth around the trunk or branches of the tree, into which the worms will be liable to go, and spin their nests as they come down from the fruit, after which they may be destroyed before they hatch out. Old cloths, placed in the crotches of the trees, may also serve as traps to catch them. Torches, or small fires lighted in orchards, in May and the early part of June, just at the edge of evening when the moths are flying about, will attract many of them into the flame, where they will be destroyed. Another plan is to place a lantern or lamp inside of a tarred barrel or against boards smeared with tar for the same purpose.

Bark Louse.—This insect attacks the bark of young apple and pear trees, and often proves quite destructive. It makes its appearance on the smooth bark, looking like a small brown scale or blister about an eighth of an inch in length, being oblong in form. This scale or blister is the dried remains of the body of the female covering and protecting her eggs, which will be found underneath from a dozen to a hundred in number. The eggs hatch the last of May, the minute dull white insects sometimes nearly covering the bark, which they puncture for the purpose of sucking the sap. Scraping and scrubbing the bark in summer with a stiff brush in strong soap suds with a mixture of kerosene oil, rather warm, will prove very beneficial. Another excellent remedy is to apply to the bark early in spring an equal mixture of tar and linseed oil quite warm, but not hot enough to injure the tree.

Blight.—This is one of the most formidable diseases with which the fruit-grower has to contend, and is generally regarded as incurable. It attacks the pear, apple, and quince, but proves the most destructive to the pear. The disease is characterized by the withering and turning black of the leaves of some of the most thrifty branches, this condition sometimes extending over the entire tree, causing the leaves to wither and fall, even in midsummer. The disease is quite liable to extend to the branches, the wood becomes shriveled and hard, and in a short time turns black, and if allowed to remain on the tree, will be liable to extend to the trunk. There are two distinct diseases known as the blight,—the INSECT BLIGHT, supposed to be caused by a minute insect, the larva of which bores into the wood, perforating it; the other, a blight supposed by many to be caused by the freezing of the sap in the wood, the theory being that when the trees have not fully matured their growth of wood, or, after having dropped their foliage permanently, a few warm days cause the sap to ascend the branches again; the sap is afterwards frozen during the severe winter, and thus produces the diseased condition.

This opinion was formerly entertained by some of our best authorities on fruit growing, and prevails at the present time to a considerable extent. It is the opinion of Prof. Caldwell of Cornell University, Prof. Burrill, and some others, that the blight is caused by bacteria, which are small microscopic organisms not over 1-8000th of an inch in length, nor of 1-16000th of an inch in breadth. It has not been fully decided whether they are animal or vegetable, but are generally thought to be vegetable growths, and increase with prodigious rapidity under favorable circumstances. A pruning knife, used on a diseased tree, may convey the disease to a healthy one, it being easily conveyed from one to another by such means, as well as by various other methods. The best remedy for the difficulty is to cut off the portion of the trees which are infested, but the work must be done in the early stages, as well as *thoroughly* done, for the bacteria may have passed three or four feet from the portions of the tree which show visible signs of having perished. As soon, therefore, as the disease makes its appearance, the affected branches should be cut considerably back of the discolored wood, and be immediately burned, as the disease may be communicated to others by means of the fungus growth in the sap, which may be easily perpetuated.

If the affected branches are not cut off considerably below the point to which the disease extends, the evil will not be entirely removed, as the diseased sap remaining will extend it to other parts of the tree. The pruning must be severe and be kept up until the disease is entirely checked. When the entire tree seems to be involved, the better way is to cut it down and burn it, root and branch, to prevent the spread of the disease. A prominent agricultural journal gives the following on the pear blight:

"It has been shown by careful microscopic examination, in its earliest stages, that this disease is caused by a minute fungus which develops in the bark and penetrates inwardly, destroying the cell structure as it proceeds. The fungus is so small that the distinguished investigator, J. Gibbons Hunt, under a powerful microscope, could not distinguish the species, but this is of no consequence. This being the cause of the disease, the preventive is obvious. Any one who is in a neighborhood liable to blight can have immunity by washing his trees annually with pure linseed oil, sulphur wash, or other things that will kill a fungoid spore without injury to the bark. Of course many get into a crevice where the washes cannot reach, and hence there may be some cases where, even though the trees be washed, there will be disease. The cause of the disease has been so clearly demonstrated, and the remedy so patent, that cases of 'fire blight' only prove ignorance or neglect.

Since the above was written, the writer has seen a beautiful row of Dwarf Duchesse d'Angoulême pears on the grounds of Mr. Hiram Sibley at Rochester, one of which was badly stricken by fire-blight, though he was told the trees were sulphur and lime washed every

year. But on personal examination of the trees it was found that only the trunk up to the branches was washed, and this, of course, could have no influence on the parts not covered by the wash"

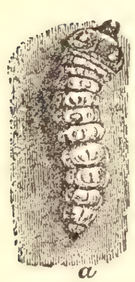
Washing the branches with solutions of potash, lime, copperas, soft soap, or carbolic acid, is often used with good effect in stopping the progress of the blight in its early stages. The washes previously recommended are also regarded by many fruit growers as a *preventive* of the blight, if applied quite early in the spring. Soils that are very wet should be avoided; also manuring too heavily where the land is already quite rich, lime, wood ashes, or bone dust being better under such circumstances than barn-yard manure. Heavily mulching the trees during the summer and fall is also excellent. Unless trees affected with the blight receive prompt and thorough attention, the disease will be liable to spread rapidly.

Black Knot.—This is a disease that attacks apple, plum, and peach trees, and is characterized at first by an irregular swelling on the limbs or trunk of a tree, which continues to increase year by year until it cracks, and resembles irregular black lumps, with a hard, uneven surface. This stops the circulation of the sap upwards, and seems to poison the sap that is disseminated downward, causing the whole trunk to become diseased. The cause of this evil is supposed to be the work of an insect. The best remedy that has ever yet been found is to cut away all affected limbs a few inches below the limit of the disease. When it appears upon the trunk or largest limbs, it will have to be cut or dug out, and care taken to remove every particle of diseased wood.

The wound should then be washed with a solution of chloride of lime, or spirits of turpentine, to prevent the farther growth of the fungus, and afterwards (if the limb be large), covered with shellac varnish, liquid grafting wax, or paint.

Borer.—There are various species of borers that attack apple, pear, quince, cherry, peach, and other fruit trees by entering the tree near the ground (usually just below the surface), and cutting their way through the wood and under the bark, sometimes completely girdling a tree. They are dangerous enemies of fruit trees, their presence often not being detected until the tree is nearly destroyed. The eggs are laid under the loose portions and scales of bark, the insects commencing to eat through the bark almost as soon as hatched. They remain and feed upon it for several months, and finally work their way into the wood. This stage of their progress may be detected by the powder that is seen coming from the bark where they are at work.

The round-headed apple-tree borer (*Saperda candida*) is one of the most injurious to apple orchards, being rivaled only by the flat-headed borer (*Chrysobothris femorata*). According to Prof. Riley this insect remains in the tree three years from the time it is hatched. Mr. D. B. Weir of Illinois, who has made a thorough study of this species, says: "As soon as hatched the young grubs begin to gnaw their way into the bark of the teer by means of strong, sharp jaws. They do not usually penetrate directly through, but reach the liber or inner bark half an inch distant from the point of entrance. In their passage through the bark they shove their excrement and refuse out through the opening of their burrow, and being of a glutinous nature it collects around its mouth in a mass as large as half a bean, or in the shape of a tear. These excretions are usually of an orange color, and are at once recognized by the experienced eye.



a

SAPERDA CANDIDA.
a, larva.

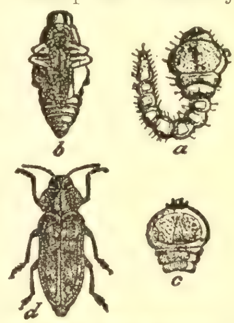
b

S. BIVITTATA.
b, pupa.

c

THE ROUND-HEADED APPLE-TREE BORER.
c, beetle.

The great majority of young larvæ reach the inner bark about September 1st, and have generally all reached it by October 1st. The first half of October is the best time to search for and destroy them. Until that time they have done but little, if any damage, and their location is readily detected by their excretions on the trunk of the tree. They are readily found and despatched by shaving off the outer bark with a sharp knife. My plan of operation has been to go over my orchards each July or August, and with a sharp hoe clean any weeds, grass, or other litter and a little soil from around the trunk of each tree, and then in October search carefully and kill the borers."



CHRYSOBOTHRIS FEMORATA, Fab.:—Flat-headed borer of the apple-tree, and of the soft maple: *a*, larva; *c*, head of larva, underside; *b*, pupa; *d*, beetle.

The beetle of the flat-headed borer makes its appearance in May or June, and is said, as a rule, to attack only those trees which have their health impaired, or have been injured in some way; also trees overpruned, and those transplanted above the proper size for such a change being more liable to the attack of the borer than those which are undisturbed; hence it follows, as a natural consequence, that keeping the trees in a healthy condition is one of the best methods of preventing the attacks of this insect. Various measures are resorted to as a preventive of the attacks of borers. Kerosene oil applied about the lower part of the trunk, in the early part of June, scraping away the soil for this purpose, is a very good remedy; also to hollow out the soil four or five inches deep, making a basin, and pouring two or three gallons of hot water, is very effectual and safe with bearing trees, but for young trees it is better to apply some other remedy, such as the use of wire to run into the hole made by the insect, and crush it to death. This method is, however, not always effectual, as the channels eaten by the worm are frequently very irregular. Scraping away the earth and the trunk, and heaping up ashes around the tree will often prove quite successful in keeping the borer from making a lodgment.

A wash made of half a gallon each of soft soap, hot water, and six ounces of carbolic acid, with ten gallons of cold water afterwards added, applied early in June, will also prove effectual. Whitewashing, painting with a mixture of soap, lime, and Paris green; also applications of coal tar have been tried with benefit. Cutting out with a sharp knife before the borer enters the wood may be easily accomplished, and the use of a wire to run into the holes made in the wood, will prove effectual when the insect can be reached.

Canker-Worm.—The canker-worm (*Anisopteryx pometaria*) is a very destructive enemy, attacking both the fruit and leaves. The eggs from which this worm is hatched are laid by a moth nearly destitute of wings. This moth commences to ascend the trees early in spring, generally in March, laying a number of eggs, from which the brownish, yellow-striped canker-worms are hatched about the middle of May. To prevent the moth from climbing the tree, a cloth band coated with tar, printing ink, or a mixture of tar and oil is frequently fastened around the trunk of the tree. This mixture will need to be renewed every few days, or it will become dry. In attempting to pass this obstruction, the insects are caught by the moist, sticky surface, and die, or may be easily caught and destroyed. Another method is to nail a rope around the trunk of the tree, and afterwards nail a strip of tin five or six inches wide on the rope, or around the trunk, with the lower edge outward. The canker-worm may be driven out of trees that have fruit, by syringing them with a solution of warm lye made of wood ashes and a little kerosene oil. Strong soap suds will also prove effectual.

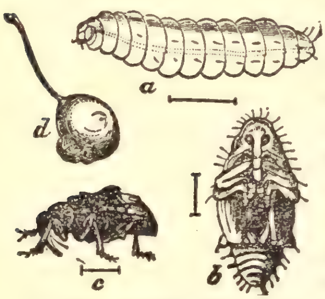
Caterpillar.—Caterpillars are a great pest in an apple orchard, frequently proving very destructive to the crop. The common or "tent caterpillar" (*Clisiocampa americana*) is the offspring of a reddish brown moth of medium size. These insects are seen in great numbers in midsummer, flying only at night, and often enter houses in the evening, being

attracted by the light. They lay their eggs principally in the apple and cherry trees, depositing them by thousands around the forks and extremities of the young branches. About the middle of May these eggs hatch, and the young caterpillars come forth in myriads, and weave their nests or tents among the forks of the branches, feasting upon the leaves, sometimes entirely divesting trees of their foliage, the effect of which is to stunt the growth of the fruit and wood, enfeebling the tree, and sometimes, if unmolested for a few seasons, entirely destroying its life. They remain in the caterpillar state for six or seven weeks. The best time to destroy them is in the morning before nine o'clock, or towards evening, when they will be in their nests. They can be easily taken from small trees and crushed. On large trees, it is a very easy matter to burn them in their nests with a torch of some kind attached to a long pole. Another very effectual method is to fasten a sponge to the end of a long pole, and, wetting it with strong liquid of ammonia (hartshorn) or naphtha, turn it slowly in among the nests, attaching them to the sponge.

Cherry Slug. — This often proves very injurious to cherry and pear trees. It is snail-like in appearance, about half an inch in length, has a smooth, shining, and jelly-like skin, and is of a dark greenish-brown color when filled with food. Dusting the trees with dry wood ashes when they are wet with dew will usually exterminate it, or syringing the trees with strong soap suds.

Codling Moth (*Carpocapsa pomonella*). — This is a grayish-colored moth marked with brown, and is about half an inch in length. Its eggs produce the common apple worm. For directions for destroying it, see APPLE WORM.

Curculio. — The plum curculio (*Conotrachelus nenuphar*) is doubtless the most destructive weevil with which the fruit grower has to contend. It attacks the fruit of the plum, nectarine, apricot, cherry, peach, apple, pear, and quince, by making a little crescent-shaped incision, in which it deposits its eggs; it also deposits in the black knot of the plum tree. It seems to be more destructive to the plum than to any other fruit; the raising of plums has become almost entirely abandoned in some sections of the country, owing to its ravages. It is described by Prof. Thomas, of Illinois, as follows: "It is of a dark brown color, variegated with spots of white, ochre-yellow, and black; the snout is rather longer than the thorax; the surface of the latter is uneven; the wing cases have two shining black humps or tubercles on them, one on each case, about the middle, close to the suture; behind these is a broad band of dull yellow and white; each thigh has two little teeth on the under side. It varies in length from a little over one-eighth to one-fifth of an inch. When disturbed, it has a habit of drawing up its legs, and bending its snout under its breast, when it is easily mistaken for a knot or wart on a limb or fragment of bark. The beetles usually come forth from their winter quarters in May and June, some appearing in the southern part of Illinois as early as April, and from that time on during the season as late as June, according to the latitude and the season. The female, when about to deposit her eggs, makes a minute cut with the jaws at the tip of her snout, and, thrusting her snout into this opening, enlarges it sufficiently for the reception of an egg. Then turning round she drops an egg into the opening, which she afterwards thrusts to the bottom of the cut with her snout; then cuts the crescent around one side of the orifice. One egg only is deposited in an opening, which is elongate-oval in form, about three-hundredths of an inch long, the diameter being about one-third the length; it is of a pearly white color. Each female is supposed to have a stock of from fifty to one hundred eggs, and to deposit from five to ten a



CONOTRACHELUS NENUPHAR (HERBST).

Plum and peach curculio—*a*, larva; *b*, pupa; *c*, beetle; *d*, a plum, showing the crescent slit made by the female after depositing her egg.

day. While those which appear earliest begin this work about the middle of May, it is continued by others which appear later, until the last of June or the first of July, thus extending the period of egg depositing to about two months.

The larva which is hatched from the egg, is a little footless worm, somewhat maggot-like, except that it has a distinct head and is less attenuate at the extremity; is of a glossy yellowish-white color, but partakes more or less of the color of the flesh of the fruit in which it resides; there is a lighter line running along each side of the body, with a row of minute black bristles below, and a less distinct one above it; the stomach is rust red or dark brown, the head yellowish or pale brown. Length, when full grown, about two-fifths of an inch. The fruit containing this grub does not usually mature, but falls to the ground before it is quite fully grown. When it has completed this stage it leaves the fruit now on the ground, and burrows a few inches into the earth, where it remains in the pupa state." In the following spring it emerges from the ground a perfect beetle, and renews its attacks on fruit. The most effective method of destroying this insect is to permit the chickens to have free access about the orchard. This has been found to be a *sure* remedy in numerous instances, the young chicks eagerly destroying the insects. The case of a gentleman who abandoned his plum orchard, owing to the ravages of the curculio, and using it for a chicken yard, has already been mentioned. Leaving the plum trees simply for a shade, he was astonished to find that every year after the chickens occupied the yard he had a good crop of plums. We know of no remedy more effectual than this for protecting the plum orchard from this insect. Dusting with wood ashes frequently when the leaves are wet, smoking the trees with petroleum, leather, or woolen rags are sometimes beneficial; also spraying the young plums with soap suds. Picking up all the fruit that falls, and burning it, placing sheets or blankets underneath the trees, and suddenly jarring the trees, by which means the insects, after falling, may be killed, are all more or less effectual in getting rid of the pest. The best time for jarring the trees for the purpose of capturing the insects is in the morning, when they are quite sluggish, and may be easily caught.

Grape-Vine Flea Beetle. — This insect is very destructive to the grape-vine in some sections. Prof. C. V. Riley says of it: The beetles which hibernated begin their destructive work in the spring as soon as the buds commence to swell, and it is at this early period that the greatest damage is done by the beetles boring into and feeding on said buds. Later in the season the beetles feed upon the leaves, and upon these, in the month of May, the female lays her small, orange-colored eggs in clusters. These soon hatch, and the young dark-colored larvæ soon riddle the leaf, as shown in the cut (*a*), or when very numerous completely devour it, leaving only the largest ribs. In about a month the full-grown larvæ (*b*) descend into the ground, where each forms a small earthen cell (*c*), and changes to a dull yellowish pupa of the shape normally assumed in this family. The perfect beetle issues about three weeks later, from the middle of June to the middle of July, and again begins to eat the leaves, but the damage done to them is trifling compared with that done in early spring. So far as we have observed, there is but one annual generation, but it is probable that in the more Southern States there will be two. As soon as cold weather approaches, the beetles

GRAPE-VINE FLEA-BEETLE.

a, leaf, with larvæ, natural size; *b*, larva, enlarged; *c*, cocoon; *d*, beetle, the swollen hind thighs not shown (after Riley).

retire under fallen leaves in the ground, at the base of trees, under loose bark, in houses, in short, in any place which offers shelter from the cold.

In considering the best means of preventing the injuries of this insect, it must be borne in mind that, according to our observations, the female beetle deposits her eggs by preference on the leaves of the wild grape-vines, as the larvæ are rarely met with in cultivated vineyards. It is against the perfect beetle, therefore, that we must direct our efforts at destruction; and while it is undoubtedly desirable to keep the vineyard clear of rubbish in winter time, by burning wherever fire can be used safely, this means of destruction loses much of its importance by the fact that the beetles hibernate in the woods and in any number of other places where they cannot be destroyed by fire. Dry lime and hellebore, which may be used to advantage against the larvæ, have proved useless against the beetle, while lye and soap suds cannot be used strong enough to kill it without injurious effects upon the plant. Tin pans or pails with some liquid at the bottom have been used to advantage for collecting the early beetles, which could be knocked into them, and we have repeatedly advised for this and other insects like the Grape-Vine *Fidia*, which fall to the ground upon disturbance, the use of sheets along the trellis to catch them. Unless repeatedly shaken from such sheets into vessels containing liquid, the beetles will of course soon escape.

The wonderful efficacy of kerosene in destroying insect life has long been known. It was used three years ago with excellent effect in shallow tin pans, or on stretched sheets of cloths, for the destructive locust of the West, and we strongly recommend its use in a similar manner for the destruction of the Cotton Worm, when brushed off from the plants.

Mr. L. G. Howard, Assistant Entomologist to the Department of Agriculture, has employed it successfully on sheets against the Grape-Vine Flea-Beetle, finding it so satisfactory that he did not hesitate to recommend it in the following terms: "Take two pieces of common cotton sheeting, each being two yards long and half as wide; fasten sticks across the ends of each piece to keep the cloth open, and then drench with kerosene. Give the sheets thus prepared to two persons, each having hold of the rods at opposite ends of the sheets. Then let these persons pass one sheet on either side of the vine, being careful to unite the cloth around the base of the vine; then let a third person give the stake to which the vine is attached a sharp blow with a heavy stick. Such a blow will in nearly every case jar the beetles into the sheets, where the kerosene kills them almost instantly.

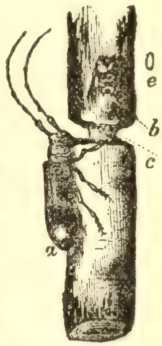
This process, after a little experience, can be performed almost as rapidly as the persons employed can walk from one vine to another. The expense necessary is very trifling, and boys can do the work quite as well as men. Warm, bright afternoons are the proper times for this work to be done, and it should be performed faithfully every sunny day until the vines are out of danger."

Mildew is a disease which frequently attacks the grape and the gooseberry, also the peach, but the latter only to a limited extent. This disease is supposed to be due to the growth of a very minute fungus. The best preventive of the disease is to keep the plants in a healthy, thriving condition by giving them all the elements of plant growth that are essential to this condition, with a sufficient amount of air and sunlight among the vines and foliage, by planting far enough apart to secure this object, and by proper pruning. Potash is supposed to be a necessary element of growth for the grape, and where this element is lacking in the soil, it should be supplied as a fertilizer in the form of wood ashes, or some other material. It has been found by experiment, that where there was a lack of potash in the soil this disease was more liable to prevail, but when a liberal amount was supplied, the disease subsided. It is also apt to be more prevalent in some seasons than others; for instance, when the weather is warm and moist; but some varieties are less subject to this disease than others, being better able to withstand it.

As soon as mildew appears, dust the vines with wood ashes and sulphur in equal

quantities, this treatment to be repeated every week or two as long as it continues. Another remedy said to be effectual, is to sprinkle the vines just before the buds begin to start, with a solution of sulphate of copper (*blue stone or vitriol*). By planting the vines sufficiently far apart and giving good culture, there will be little trouble with this difficulty. For mildew in gooseberry culture, it is well to have the bushes set where they will be partially protected by shade during the heat of the day. Careful pruning so as to keep the branches about six or eight inches apart will also prove beneficial. Sprinkling the bushes with weak lime water, also scattering lime, salt, and sulphur upon the ground quite liberally under the branches is also highly recommended. Heavily mulching with coal ashes is also said to be quite effectual.

Twig Girdler. — This insect is troublesome in some sections, it being known to girdle a number of trees of different kinds, such as the pear, apple, peach, plum, persimmon, elm, hickory, etc. Professor Riley says of it: "Both sexes of the beetle feed upon the bark of the hickory, but only the females, so far as we are aware, girdle the twigs. After partly girdling a particular twig, she lays a number of eggs in the distal portion that has been killed, each egg usually inserted just beneath a bud. The twig usually, though not always, breaks off by the force of the wind during winter, and the larvae flourish upon the dead wood as it lies upon the ground, burrowing just beneath the bark, and when very numerous leaving little else than the outer bark. The beetles do this work in the fall of the year. The young larva hatches and works a short distance into the twig before winter sets in, and continues working through spring and summer, transforming to pupa only towards summer. Some writers have stated that two years are required for its development. While this may be true farther north, it is not true of the latitude of St. Louis, where we have reared the insects repeatedly from the egg.



TWIG GIRDLER.

ONCIDERES CINGULATUS: *a*, beetle girdling; *b*, point where egg is inserted; *c*, form of girdle; *e*, egg.

Spraying or washing the branches with strong soap-suds mixed with kerosene oil will prove effectual in destroying the insect; also by picking up and burning all the twigs that have been broken off at the point girded, will be the means of destroying a large number of the larva.

Rose Bug. — The rose bug frequently does great damage by eating the blossoms and leaves of grapes, apples, etc., as well as those of the rose. The best means of driving it away, is to apply Pyrethrum powder, either in solution or in powder. This is a very simple, economical, and efficient remedy; the bulk of the powder is easily dissolved in water, and may be applied with a large atomizer in fine spray in the proportion of a quarter of pound of the powder to three or four gallons of water. This solution is most effectual when first made, and looses strength the longer it is kept, consequently it is always best to use only that which is fresh made, or has not been mixed longer than a day or two. When applied in a powder, it may be mixed with five or six parts of wheat flour, and lightly sifted over the vines. This powder can be procured of any druggist, and when properly applied is a very efficient means of exterminating many kinds of beetles, worms, etc., from plants. Hand-picking of these bugs is sometimes resorted to, but it is a slow and tedious process.

Rot. — The rot is sometimes very damaging to grapes. Like mildew, it seems to be caused by a parasitic fungus, and warmth and moisture combined are essential to its development. It has been found that all varieties of grapes are liable to its attacks at all stages of the growth and maturity of the fruit; some varieties, however, appear to resist the attacks better than others. It has been found by experiment in covering the bushes when small with thin paper bags or mosquito netting, and keeping them on until the close of the season, that this difficulty is prevented, which proves that the infection takes place by way of the

atmosphere. A board covering twenty or twenty-four inches wide is also said to be very effectual as a preventive.

Web Worm.—This worm is a very destructive caterpillar which attacks many kinds of fruit trees as well as other trees. The worms are small, light-yellow, with a black head and feet, a broad, dark-colored stripe on the back and another stripe beneath which is thickly covered with white hair. The eggs are laid on the under side of the leaf near the end of the twigs and branches. These are soon hatched, and the larvae commence eating the tender portions of the leaves, leaving only the skeleton, while they are always very active spinning their webs, which they do by weaving from one leaf to another, thus attaching three or four leaves together as a framework for the web. They appear in May and may be seen even in October, and sometimes leave trees looking brown and dead as though they had been burnt by fire. For exterminating these pests, the same methods are recommended as for caterpillars (which see).

Woolly Aphis (*Aphis lanigera*), sometimes called the American Blight, is a minute, white, downy insect that makes its appearance in the branches, — usually in the crotches and crevices, — and resembles mildew. These lice increase with great rapidity, and if not interfered with, will be likely to produce a diseased condition of the whole tree. They are, however, very easily destroyed by applying a wash of strong soap-suds, lye made of wood ashes, or whitewash made of unslacked lime with a little sulphur added. A wash of a half pint of kerosene oil mixed with a gallon of soap-suds is also an excellent remedy; also a wash of half an ounce of carbolic acid and a half pint of water will prove effectual.

Yellows. — No disease has proved so destructive to the peach as the yellows. It is characterized by a yellow appearance of the leaves, the production of very slender, wiry shoots a few inches in length upon the branches, the premature ripening of the fruit, a discoloration of the flesh, and spots of purplish-red externally. The disease spreads without actual contact, and frequently destroys large orchards. It may be communicated by contact of the roots, by pollen from the flowers of diseased trees, and by using a pruning knife upon healthy trees that has been employed in pruning diseased ones. The yellows has generally been regarded as incurable. Some of the most recent experiments, however, seem to indicate a remedy in a copious application of potash, or of some of its compounds, as promising a prevention, if not a positive cure, — muriate of potash having been used for this purpose. This remedy is based upon the theory that the vessels of the diseased tree are surcharged with starch, which the potash dissolves and dissipates.

Dr. Goessmann, of the Massachusetts Agricultural College, found on examining a peach orchard, that the trees which grew upon the top of a knoll were much diseased, while those on low and richer ground, and which had made a more vigorous growth, were exempt from it. Also, that in analyzing the fruit and branches of both healthy and diseased trees, the greatest difference in the fruit was, that the diseased specimens contained nearly twice as much lime as the healthy ones, and more phosphoric acid. In the branches analyzed, the diseased portions also contained the most lime, but much less potash. Other analyses showed an accumulation of starch in the diseased trees.

The experiment was made of treating the affected trees with three or four pounds of muriate of potash, together with the usual quantity of a phosphatic fertilizer, for each tree, and the diseased branches were cut back once or twice to the healthy wood. The new growth of branches soon regained a green color, and the trees were shortly in a vigorous condition. Subsequent examinations made by Professor Penhallow showed that healthy wood had but little stored starch, while the diseased wood showed the invariable presence of large quantities of starch, and also an abundance of fungous growth, which first appears on the surface. The fungus is found on trees which, once diseased, have been restored by the treatment

mentioned, which induced Dr. Goessmann to suspect that the fungus might be the effect and not the cause of the disease. In applying the muriate of potash to a tree six or eight years old, it should be spread over a circle sixteen feet in diameter, but kept away from the foot of the trunk. He prefers applying the phosphate in the form of dissolved bone-black.

Dr. Goessmann also states that sulphate of potash will not answer the purpose as a substitute in this disease, but muriate of potash should be used, and that it might be applied in a mixture of salt and ashes. Professors Caldwell and Burrill are of the opinion that the yellows in peach trees are caused by bacteria, also that it is the same growth that produces blight in pear trees, and the treatment of severe pruning or cutting away of the diseased branches is to be recommended, the same as for pear blight. We would recommend to all fruit growers in whose orchard the yellows makes its appearance, or as a preventive of it, a test of Dr. Goessmann's experiment. When the disease has progressed so far that a renewal of vigor is impossible, the tree should be cut down and immediately burned, both root and branch, if possible, and no tree be set in the place occupied by the diseased one, at least, for several years.

Protecting Trees from Mice.—Mice often prove very destructive to fruit trees, especially young trees, since they gnaw the bark from the stem near the roots, sometimes entirely girdling them. We have known of a large number of fine orchards being ruined by this means. They usually work under the snow, making their nests in the grass and rubbish that may be collected around the base of the trunk, especially if the trees stand in turf ground. Sometimes they go from tree to tree on the top of the crust formed by the freezing of the rain upon the top of the snow. Heaping up coal ashes or soil eight or twelve inches high around the trunks of the trees, or packing the snow hard around the trees, will sometimes prove effectual. Another very good plan is to make a mound of compact manure a foot or more high around the trunks late in autumn. This should be packed very closely around the trunk in order to secure the desired result. Straw, hay, or anything that would serve as material from which mice could make their nests should be carefully avoided. Soon after the snow is gone, the manure may be spread under the trees, and thus be made to serve a double purpose of protection in winter and a fertilizer in summer. Pieces of old tin fastened securely around the trees will also prove a complete protection; they should, however, be pushed down into the soil an inch or two to prevent the mice from crawling underneath.

Rabbits are also apt to injure fruit trees, in the same manner as mice, except more extensively. Encasing the trunks in old tin, or tarred pasteboard, serves as a good protection. Other plans highly recommended are to rub the bark of the trees with fresh blood or liver, or to kill a rabbit and to rub his flesh and blood over the trunks of the trees. This should be repeated two or three times during the winter. Sulphur mixed rather thick with refuse lard, and a half teacupful of kerosene added to each quart of the mixture, makes a good application for the trunks of the trees, one thorough application answering for a year or more. A mixture of fresh lime (first slacking the lime in water), flour, and soft soap is also highly recommended by those who have used it.

Sheep and Cattle often injure fruit trees, the former by gnawing the bark and the latter by browsing off the tender shoots, and rubbing against the trunks, thus loosening the roots and breaking the stems and lower branches. Rubbing the trunks of the trees with liver will prove effectual in preventing sheep and lambs from gnawing the bark. Fencing around each tree will also serve as a protection, but it must either be made very close or be so far from the trunks that the prematurely ripened fruit will fall within the enclosure, and thus one of the great benefits of keeping sheep in orchards (that of eating this fruit and thus destroying the larvæ they contain) will be lost. Cattle do no possible good in an orchard, but much injury, and should never be allowed there.

Diseases and Enemies of Small Fruits.—Some of the diseases and enemies of the larger fruits are also known to attack the small fruits, but the majority are peculiar to certain species of vegetable growths. We accordingly, for the sake of convenience, give in this connection the treatment for the diseases and enemies of such small fruits as the strawberry, blackberry, raspberry, currant, gooseberry, etc., as recommended by Professor A. S. Fuller, an able authority on this subject.

The Strawberry.—"Among the insect enemies of the strawberry the common White Grub is probably one of the most destructive. It is the larva of the May-beetle, June-bug, or Dor-bug, being known by all those names in different parts of the country. There are over fifty distinct species of May-beetles found in this country north of Mexico, but the one here referred to is our most common brown May-beetle, *Lachnosterna fusca* of Fröhlich. These beetles frequent meadows, pastures, and uncultivated fields, for the purpose of depositing their eggs in places where their young will be sure of plenty of food, and not likely to be disturbed. The young grubs as soon as hatched commence feeding upon the roots of various plants, those of the strawberry and different kinds of grasses being preferred to the weeds. These grubs live three years before passing through the pupa state and coming forth as beetles. During these three years of constant work upon the roots of plants they may do much damage to whatever kind they may attack. Their injury to strawberry plantations results mainly from bad management and the failure of the grower to use preventive measures.

Good old pasture and meadow lands are frequently selected for strawberry plantations, and sod is turned over, and as soon as sufficiently rotted, the plants are set out. In the mean time the grubs that were already in the ground, and perhaps of various ages from a few weeks to a year or two, have been fasting, or making an occasional meal of the half-decayed grass roots. Finding fresh strawberry roots thrust before them, they commence a most vigorous attack upon such tender food. The planter is astonished to see his strawberries disappear, and wonders where all the grubs could have come from in so short a time. Now in regions where the White Grub abounds it is not safe to set out strawberries on freshly inverted sod; but the land should be cultivated at least two seasons in some crop requiring frequent hoeing and plowing, before using it for this purpose. Neither should the strawberry plantation remain or be continued on the same piece of land for more than two or three years, if what is called the matted or bed system of cultivation is pursued; because the parent beetle soon learns that these weedy, little-disturbed plantations, are a safe place for her to deposit her eggs.

To avoid injury to strawberry plantations by this insect, use land that has been occupied at least two years in some hoed crop, like corn, potatoes, or beans, and then set out a new one on fresh land as soon as the old ones begin to fail. As all the May-beetles are nocturnal in habit many may be taken by using tubs of water with a floating light in the center. A few hundred taken every evening during the first few weeks of summer will do something toward diminishing the number of the succeeding generations in a neighborhood, but the birds and domestic fowls are the strawberry grower's most efficient helpers in the way of destroying May-beetles and White Grubs. Among the various other kinds of insects injurious to the strawberry there is perhaps none more destructive than that known as the 'Strawberry Worm.' This pest is a small, slender, pale-green worm that attacks the leaves, eating large holes in them. When at all abundant it destroys the entire foliage, and of course prevents further growth of the plants. A few years ago this pest almost ruined the plants in my garden, and of late it has not been very abundant, although it has not entirely disappeared. This Strawberry Worm is the larva of a small black fly (*Emphytus maculatus*). Dusting the leaves with lime would probably check the increase of this insect. There is also

another worm that attacks the leaves of the strawberry, but this is a leaf-roller and the caterpillar of a small, handsome moth (*Anchylopera fragariæ*).

I have not observed it in my grounds, but it is quite abundant in the Western states, also in Canada, where it is occasionally very destructive. In addition to the above there is a small snout-beetle known as the Strawberry Crown-borer (*Tyloderma fragariæ*), that works in the crowns of the plants, destroying the embryo fruit and stalks and leaves. The remedy proposed is to plow up the strawberry plantations soon after gathering the fruit in the summer, and while the little grubs are still in the crown of the plants. Several other species of noxious insects might be added to the above list of those injuring the small fruits, but I think enough has already been named to show that the berry-growers do not find the business quite so profitable or free from annoyances as many persons seem to imagine."

The Blackberry.—Some thirteen years ago the cultivators of the blackberry in some sections noticed that the young growing canes in summer would occasionally curl, twist about, and often assume a singular, fasciated form, resulting in an entire check to their growth. The leaves on these infested shoots did not die and fall off, but merely curled up, sometimes assuming a deeper green than the healthy leaves on the same stalk. At the approach of winter, the infested leaves remained firmly attached to the diseased stems, and all through the cold weather, and far into the spring, these leaf-laden and diseased stems were a conspicuous object in many of the blackberry plantations of this State. If the infested shoots are examined in summer, thousands of minute insects of a pale yellow color and covered with a powdery exudation will be found sucking the juices of the succulent stems and leaves, causing the crimping, curling, and twisting of these parts as described.

This parasite resembles somewhat an ordinary green-fly (*Aphis*) or plant-louse, but according to the observations of Professor Riley it belongs to the closely allied Flea-lice family (*Psyllidæ*), distinguished from the plant-lice by a different veining of the wings, and by the antennæ being knobbed at the tip, like those of the butterfly, the knob usually terminating in two bristles. These insects jump as briskly as a flea, from which characteristic they derive their scientific name. They have increased very rapidly during the past half dozen years or more, and unless fruit-growers make a more vigorous fight than they yet have done, they will soon get the mastery of most blackberry plantations. The only practical method yet discovered for checking the ravages of this insect, is, to cut off the ends of the infested canes and burn them. This operation should always be performed either in the morning, or during cool, wet weather, else many of the insects will escape, and at all times the severed shoots should be immediately dropped into bags and in them carried to the place where they are to be burned, and there emptied into the fire. If every one having blackberry bushes in their gardens would practice this method of destruction, this pest would soon cease to do much harm.

Several species of borers infest the blackberry: the most common one is the larva of a small, slender, red-necked beetle, the *Oberea perspicillata* of Haldeman. The small, legless grubs bore the pith of the canes, causing them to die prematurely, or so weakening them that they are broken down with the wind. As there are some fourteen or fifteen species of the *Oberea* now known, it may be that more than one species breed in the blackberry. Thus far, however, I am not aware that they have been very injurious, but it would be well to gather all infested canes and burn them with their contents. The blackberry is subject to the attacks of several species of gall-insects. A fuzzy, prickly gall on the twigs is produced by a four-winged fly (*Diastrophus cuscutæformis*). Another species of the same genus (*Diastrophus nebulosus*) produces a large pithy gall on the canes, but both of these gall-makers have very formidable parasitic enemies which keep them in check. There are also a few leaf-eating beetles, slugs, and caterpillars, that sometimes attack the blackberry, but they are seldom sufficiently numerous or injurious to attract much attention. The larger

species are readily destroyed by hand-gathering, and the smaller ones can usually be driven off by dusting the plants with lime.

The most formidable enemy, however, of both the blackberry and raspberry is what is called the Orange-rust (*Uredo ruborum*): It is perhaps more abundant on the Black-cap raspberry (*Rubus occidentalis*) than on the ordinary varieties of the blackberry; still it is sufficiently abundant and destructive to all to attract the attention of horticulturists throughout the country. I do not know of any remedy except to stamp out the disease by rooting up every affected plant and burning it. It may be that applications of lime, salt, or some similar substance would check the disease, and while these may be safely tried as preventive measures, the destroying of all infested plants should not be omitted.

The Raspberry.—As the raspberry is closely allied to the blackberry and belongs to the same genus, the diseases and insects infesting both do not materially differ. Some few species of insects seem to prefer the raspberry, notably among which is what is called the Red-necked Buprestis (*Agrillus ruficollis*), a small beetle that seems to be particularly fond of the red and black-cap varieties, but will occasionally attack the blackberry. The larva bores the canes in summer, causing large excrescences or galls, checking the flow of sap, and causing the death of the cane. This insect seems to be far more plentiful in the western than eastern States; but it is widely distributed, and every cultivator of the raspberry may as well be on the lookout for it, and gather and burn all canes upon which galls of any kind are found.

AGRILUS RUFICOLLIS.

The snowy Tree-cricket (*Œcanthus niveus*) is another insect that appears to prefer the canes of the raspberry as a nidus for its eggs to the twigs of other shrubs or trees. It will, however, use the grape, willow, peach, and other kinds, if raspberries are not convenient. The long, slender eggs are deposited in a close compact row, an inch or more in length, each egg placed at a slight angle, and deep enough to reach the pith of the cane or twig in which it is set. This weakens the canes, and they are often broken off by the wind. This injury does not amount to much, but the perfect insect has a very bad habit of cutting off leaves in summer; and sometimes extends its mischievous work to the grape-vine, trimming off both leaves and fruit, working at night when perfectly safe from observation or molestation. One of my correspondents in Texas wrote me, a few years ago, that one of these pests would completely defoliate a young grape-vine in a single night, and he was a long time in discerning the successful nocturnal pruner, and when discovered he was at a loss how to circumvent it. Destroying the eggs is the only way I know of fighting this insect.

The Currant and Gooseberry.—After two or three centuries of almost entire exemption from noxious insects, it is no wonder that our people came to look upon the currant as a fruit for everybody, and one that could be raised in almost any corner of the garden without care or cultivation; but all at once and without warning, not only did its ancient enemy from the other side of the Atlantic appear in this country and commence its destructive work, but several native species of insects joined in making havoc with our currant and gooseberry bushes. First, the imported currant worm (*Nematus ventricosus*) made its appearance about Rochester, New York, in 1857; then it was soon discovered that we had a gooseberry span-worm. (*Eufitchia riberaria*), the former being the larva of a four-winged fly, and the latter the caterpillar of a small moth. These two species

IMPORTED CURRANT WORM:—*a, a, a*, larva in different positions; *b*, side of a middle-joint enlarged, showing arrangement of tubercles (after Riley).

spread with great rapidity, and seemed for a while to defy all the usual insecticides and other methods of destruction. Then the late Mr. Walsh of Illinois discovered a native saw-fly, the *Pristiphora grossulariæ*, which was also double-brooded like its European congener, and fed upon the currant and gooseberry, rather preferring the latter.

With these three insects; with a borer or two that perforates the stems of the plants, and several species of plant-lice infesting leaves, roots, and green shoots, the cultivators of the currant and gooseberry have had all they could do to keep their plants alive, and obtain even a moderate crop of fruit. For the different species feeding on the leaves nothing has been discovered better in the way of destroying them than powdered white hellebore. A few dustings with this, at the proper time, will usually destroy these pests. Hand-gathering may also be practiced, as well as frequent cultivating the ground among the bushes, in order to unearth the worms that have passed it to undergo their transformation.

The common currant stalk-borer (*Ægeria tipuliformis*) is well known to all growers of this fruit; at least the larva or grub is, which may be found in the canes during the fall and winter months, and during this time all infested shoots should be cut and burned with their contents. There are also one or two other species of currant-borers, but as they are all found in the stems during winter, one method of destroying will answer for all.

The diseases of currants and gooseberries are mainly climatic, consequently difficult to prevent or cure. Mildew on the gooseberry is the one most dreaded, and the better way is to avoid it by cultivating only those varieties that are adapted to your soil and climate, and the native ones are preferable to the foreign on this account. In cool, moist soils, or with a liberal amount of mulch and thinning out of the heads of the plants, the European varieties may be occasionally made to succeed moderately well."

Large Fruit Farms.—The following account of two large and thrifty fruit orchards in Pennsylvania may serve to show what can be accomplished by well-directed and judicious management, combined with a thorough knowledge of the business of fruit-growing:

"The largest, finest, and most productive fruit farm in Erie County is that of Mr. A. Battles. Although this farm is only about three miles from the beautiful borough of Girard, I venture to say that many persons in this township, who are admirers of rural beauty and choice fruit, have never seen it. Of the 10,000 or 12,000 bearing fruit trees on these two hundred acres, 6,000 are apple trees; 1,500 pear trees; 2,500 peach trees; and 500 quince trees; all of choice varieties. When I visited the farm, in June, the prospect for a fine yield of apples, pears, and peaches, was flattering; but the severe and protracted drouth has caused much of the fruit to wither and fall. Mr. B. has six acres of grapes, mostly Concords, although he grows Catawbas, Isabellas, and other choice kinds to accommodate his customers. As his farm is bounded on the west by a dense forest, his fruits have never been injured by that destructive insect the rosebug.

Fourteen acres of the farm are planted to strawberries, raspberries, and blackberries. Mr. B. prefers the Crescent Seedling to any other strawberry for the table or market. Its yield is wonderful. It is larger than the Wilson, and has a finer color and flavor.

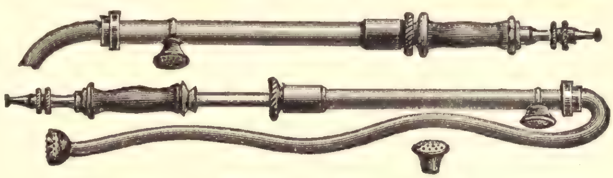
Although the extremely dry weather has probably reduced the yield one-half, I present the figures below as a result of Mr. B.'s strawberry season. Whole amount gathered from one and one-fourth acres, 275 bushels, mostly Wilsons. Whole amount for Crescent Seedlings gathered from one-tenth of an acre, 47½ bushels, or at the rate of 475 bushels per acre. Amount of sales from one and one-fourth acre, $482.51, after deducting the expense of marketing. Paid for picking the berries, $51.21. Profit from one and one-fourth acres of land, $431.30; not a bad result, considering the unfavorable season.

I noticed on the farm some splendid specimens of Lancashire swine. They run in the orchard, and become fat easily and in a short time, by feeding on the grass, and on the diseased and immature fruit that drops from the trees."

Mr. Solon Robinson, for many years a well known agricultural writer, recently traveled 1,000 miles to see a famous Pennsylvania orchard on the Juniata river, in Juniata county, 144 miles from Philadelphia, near a little station called Thompsontown. "There," says Mr. Robinson, "if the traveler going west on the Pennsylvania railway will look out south and up the steep hillside, he will see the main part of the orchard of 15,000 peach trees, 10,000 quince trees, and 9,000 Siberian crab-apple trees. And, if he could stop, and walk and ride through the orchard, as I did to-day, and find one dead or diseased tree, he will find more than I could; although I was told by Mr. Taylor, the foreman, that he did lose one tree in the section where we were. 'And how many trees are there in this section?' 'Six thousand.' If a like result can be found anywhere else on earth, I should like to be informed, that I might make another pilgrimage of 1,000 miles to see it, as I have to see this, the most healthy, thrifty, most promising young orchard I have ever seen in all my extensive journeys through the United States and Canada. Yet most of the land is unfit for any other cultivation, and a considerable portion of the ground has never been plowed, because so steep and so full of stones and roots. The orchard is owned by H. Bradford, of Connecticut. A few years ago the tract containing 440 acres came into Mr. Bradford's hands, upon the false representation that it contained valuable veins of iron ore. He bought it unseen. When seen, it was found to yield no workable ore, and only a small tract of farm land, with a few common farm buildings. The question then was, "What shall I do with it?" That question has been answered in the splendid orchard on the ground.

Sprinklers and Atomizers in Fruit Culture.—There are many kinds of implements employed in sprinkling trees and plants with various poisons, or other solutions for the purpose of destroying the insects that, by their depredations, are a great injury to crops. Prof. C. V. Riley says of such machines: "Most of the machines used for throwing liquid on a large scale, whether patented or not, are modifications of one and the same idea and principle, viz.: a barrel or other vessel to contain the liquid, a vehicle to carry it, a force-pump firmly secured to the top of the barrel, and a distributing nozzle, or several of them, connected with the discharge-pipe. The differences they exhibit are found principally in the nature of the distributors, the most successful ones being those which least clog, since it is almost impossible to get such pure water that there will not be some clogging material, even where strainers are used."

FOUNTAIN PUMP IN USE.



FOUNTAIN PUMP.

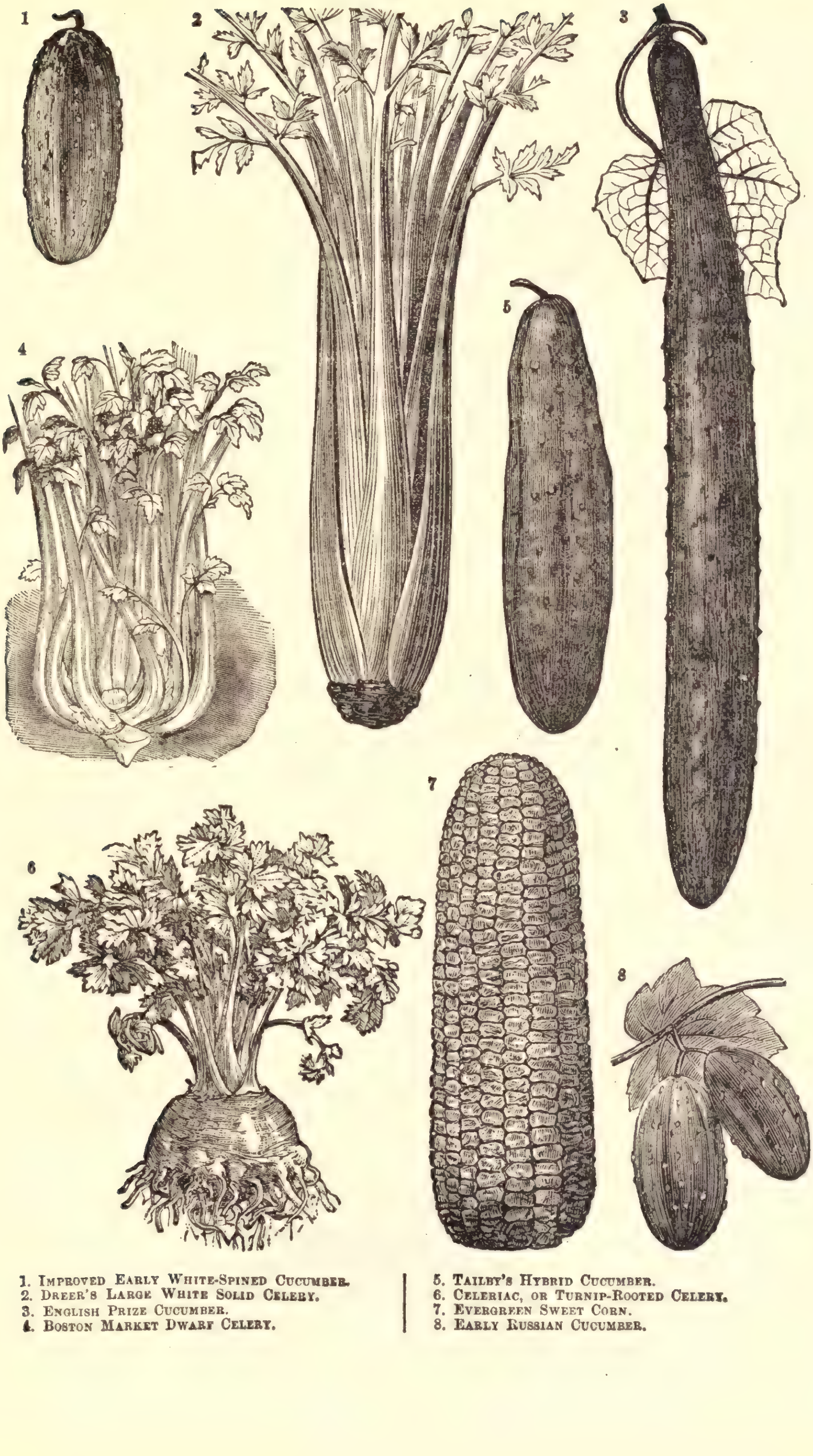
The accompanying cuts represent the portable fountain pump or sprinkler manufactured by Mr. J. A. Whitman, of Providence, R. I., showing the manner in which such machines may be used. A western farmer and fruit-grower says: "We have proved by two or three years' experiments in northern Illinois and southern Wisconsin, that a solution of arsenic or Paris green sprinkled on the foliage of fruit trees will as effectually destroy the canker worm as Paris green does the potato beetle. For want of a proper instrument to apply the solution, our experiments for some time were limited to a small scale.

With the portable fountain pump and sprinkler, a man with a team and a driver can easily sprinkle from 300 to 500 orchard trees in a day; the sprinkler throws about forty jets

at once through holes about the size of a common needle; the water can be easily thrown with such force as to go through among the foliage of the tree, thoroughly wetting, or may be thrown over the tree and fall like a gentle shower or spray; in either case but very little fluid need be wasted. As this instrument is held and worked wholly by the hands, it may be used while the operator is either standing or sitting. The fluid is drawn from the barrel or vessel containing it through a small rubber hose. The poisoned water will not injure the fruit, as it is washed away by the first shower."

It is said that two ounces of strong ammonia, mixed with a pail of water, and applied to the foliage of the trees once or twice a week, will destroy the codling moth, canker worm, and other similar insects.

Such implements are a great convenience in many ways, and may be used for various other purposes, such as watering gardens and lawns, extinguishing fires, washing windows and carriages, bringing down a swarm of bees by spraying them with water when they attempt to leave the premises, etc. A slight expense in procuring a good spraying machine of some kind will repay the farmer or fruit-grower a thousand times over, in the saving of crops from the ravages of insects, as well as that of strength and time spent in endeavoring to keep them in check by more laborious and difficult methods.



1. Improved Early White-Spined Cucumber.
2. Dreer's Large White Solid Celery.
3. English Prize Cucumber.
4. Boston Market Dwarf Celery.
5. Tailby's Hybrid Cucumber.
6. Celeriac, or Turnip-Rooted Celery.
7. Evergreen Sweet Corn.
8. Early Russian Cucumber.

PART V.

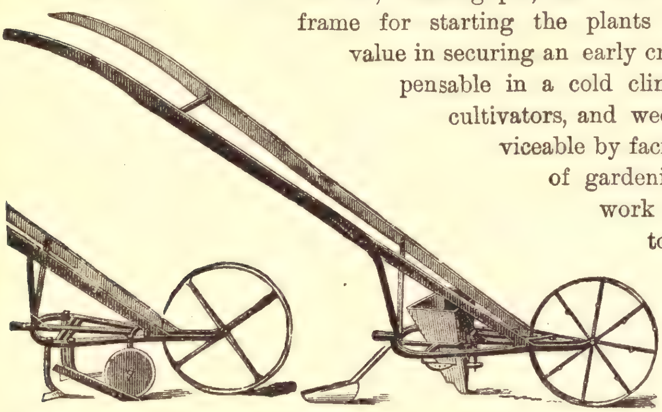
GARDENING.

FARM GARDENS.—As a general rule, farmers do not appreciate as they ought the value of a good garden, not only as furnishing the means of a choice variety of fresh fruits and vegetables for the family table, but the sanitary effect of such food, as well as the economy of raising it rather than purchasing. Farmers frequently purchase radishes, onions, lettuce, beets, early turnips, strawberries, etc., that might better be raised at home, since these things could be cultivated in abundance with but little labor and expense, and could then be obtained fresh when wanted for use, which is not always the case when depending upon a market. But there are many families among farmers that would be deprived of the variety of vegetables and fruits commonly found in the markets unless they raised them themselves, as their purchase would involve an expense which they did not feel able to meet; consequently there is in far too many families needless deprivation of many of the nutritious, healthful, and highly relished articles of diet, simply from thoughtlessness, careless indifference, or the dread of the little extra attention and labor that would be necessary in the care of a good garden. We have known many hardworking farmers who would expend an unnecessary amount of money and labor, toiling early and late upon some of their field crops with the greatest interest, but who considered it a petty nuisance to be obliged to spend half an hour each day in the care of a garden, which would probably repay them a hundred per cent. more for the real labor and time expended than the former. As a rule, the list of vegetables and fruits found in the farmer's garden is confined to potatoes, turnips, beets, peas, cucumbers, beans, lettuce, cabbages, currants, and apples. The long list beyond this, that is found in almost every village market, and frequently upon the tables of day laborers and mechanics in large villages and cities, is wanting. There is no valid excuse for this dearth of wholesome vegetables and fruits upon the farmer's table, where the materials for manufacturing them — the soil, manure, sunshine, rain, and dew — are ever at hand in such abundance. The farmer who goes without these things does so either from careless indifference or sheer shiftlessness, while he is not only deprived of a wholesome and pleasing variety on his table, but the most economic means of maintaining his own health and that of his family.

As a matter of economy, simply, every farmer should have a good garden; for when properly located, drained, fertilized, and cultivated, it will bring larger returns for the outlay and save more money for its cost, by way of furnishing supplies for the family table, than can be obtained from any of the farm crops, while it will contribute largely to the comfort and health of the family. But little extra care and attention would be required to produce a good supply of a variety of vegetables, while strawberries, raspberries, gooseberries, cherries, plums, peaches, pears, grapes, etc., might be grown in a garden in abundance for family use with even less outlay of time and labor than that required for the cultivation of the vegetables, while each would repay many times over for the trouble and expense of growing. The sanitary influence of good fruits as a part of daily diet has already been noticed in connection with fruit culture, while that of nice, fresh vegetables is scarcely less so. The most

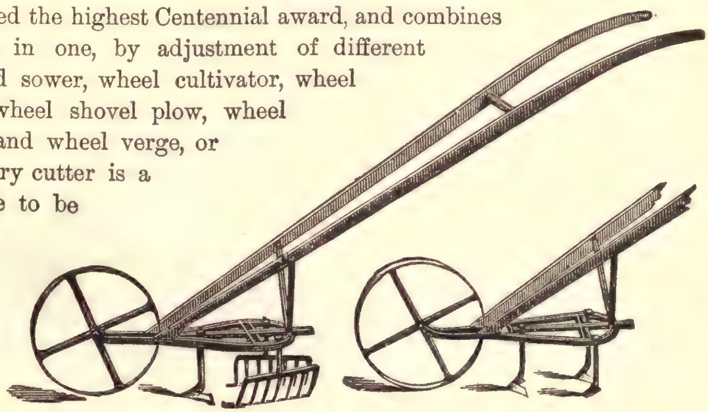
healthy families, as a rule, are the largest consumers of fruit and vegetables. The sub-acid or acid of fruits regulates the bile and the digestive apparatus generally, preventing fevers, indigestion, and other ills of the system. The cultivation of a good garden, with a large variety of vegetables and fruits that are adapted to the climate, also, has an important bearing upon the success of field husbandry, since it awakens an interest in agriculture generally, cultivates habits of observation, stimulates enquiry, leads to study and reading, expands the mind, and makes farming more a business of the mind than of muscle; hence it has a tendency to elevate the farmer and his occupation, making farming more of a successful business enterprise, and less of an unskillful and unremunerative drudgery.

Garden Implements.—In the proper management of the garden, there are many aids in the form of implements which may be regarded as indispensable to thorough and efficient cultivation These comprise the spade, fork, shovel, rake, hoe, trowel, garden line and reel, watering pot, and wheelbarrow, while a hotbed or cold frame for starting the plants for early planting is of great value in securing an early crop of vegetables; in fact, indispensable in a cold climate. Many of the wheel hoes, cultivators, and weeders now in use are very serviceable by facilitating and lessening the labor of gardening, as well as performing the work in a more thorough and satisfactory manner than could be done by hand. In the use of such implements, the width of the spaces between the rows and drills must not only vary according to the nature of the crops cultivated, but to suit the width of the weeder and cultivator in some one of its adjustable forms. The accompanying cuts represent the different combinations of the well-known and valuable garden implement invented by Mr. Wm. G. Comstock, for many years an extensive seed grower, and manufactured by the Comstock Brothers, of East Hartford, Conn. This machine received the highest Centennial award, and combines the following implements in one, by adjustment of different attachments: A wheel seed sower, wheel cultivator, wheel rake, wheel scuffle hoe, wheel shovel plow, wheel strawberry-runner cutter, and wheel verge, or turf cutter. The strawberry cutter is a sharp steel wheel and knife to be fixed to the cultivator and weeder for removing strawberry runners, cutting the runners and cultivating between the rows at the same time. The Seed Sower is an attachment that may be combined with the cultivator and weeder, and can be attached in five minutes. It sows beet, parsnip, and other seeds difficult to sow, or that can be sown with any seed sower, with the



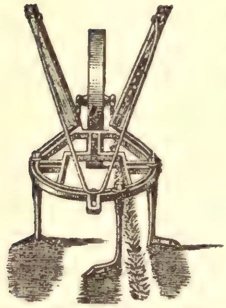
Cultivator with Strawberry Cutter. Seed Sower.

COMSTOCK'S SEED SOWER AND CULTIVATOR COMBINED.



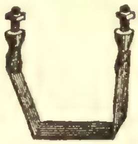
AS A WEEDER. AS A CULTIVATOR.

greatest regularity, without waste or clogging, is sure not to clog with rough or imperfectly cleaned seeds, and stops sowing the instant the machine is at rest. The Verge Cutter is a steel tool, to be fixed to the cultivator, for cutting and paring the turf edges of walks, and borders in lawns and gardens. The Scuffle Hoe is set in the frame diagonally, with the standards in the outside slots on both sides, and may be used to scrape and clean the surface of walks and alleys. This, and the Verge Cutter, are useful accompaniments to a lawn mower. The Mole Plow runs under ground and loosens neavy soils, to let in air, rain, and fertilizers to the roots, without disturbing the plants — similar to a subsoil plow. The changes for each kind of work can be made in a few minutes, and every implement of the combined machine works as well as if made specially for the purpose. We are familiar with the working of this implement, and are confident that when used alone or with any of its adjustments, it will give entire satisfaction.



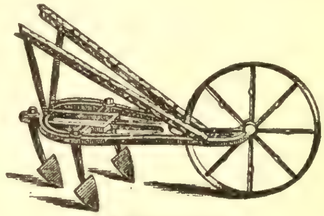
Strawberry Runner Cutter.

Verge or Turf Cutter.



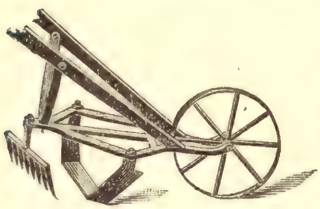
Scuffle Hoe.

Mole Plow.

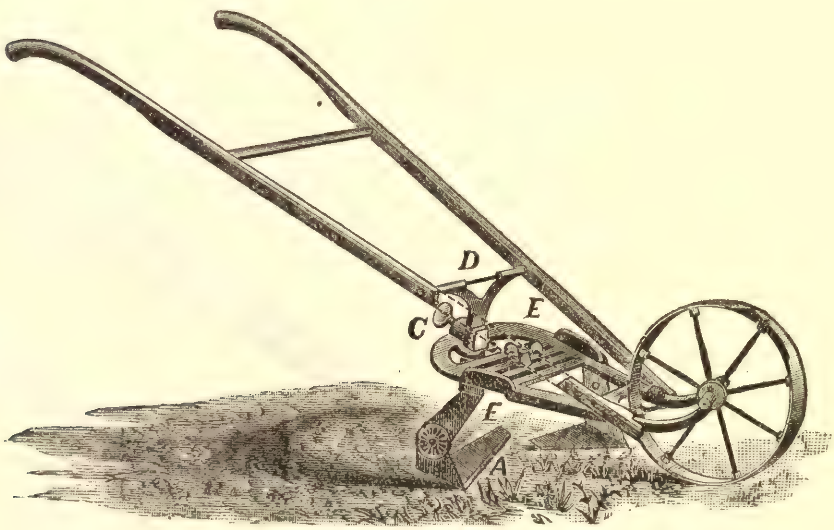


As a Shovel Plow.

The following cut represents an implement which combines a scuffle hoe, turf cutter, and edging knife in one. This will cut turf of uniform width and thickness, and may be used for cutting the edges of walks and borders, and for scraping and cleaning alleys, etc. It is also used very effectually as a cultivator.



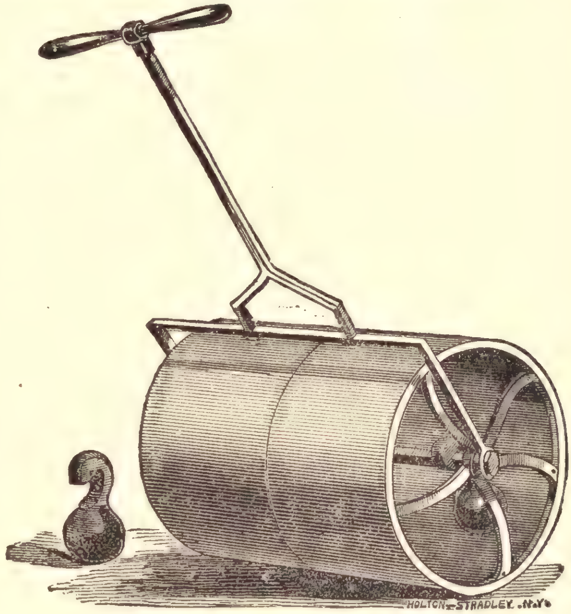
TURF CUTTER, ETC.



RUHLMANN'S WHEEL HOE.

NOTE.—*A*, the cast-steel knife, corrugated to be set at any angle desired; *C*, thumb-screw to raise or lower the handles; *D*, ridged brace for supporting and regulating handles; *E*, thumb-screw for regulating blade shanks.—*New York Plow Co.*

A garden roller will also be found useful in pressing the soil upon the seed after planting, thus causing it to germinate more quickly than it would if the soil were left loose. For market gardening, a seed sower would be essential. A garden marker is also a great convenience for marking the place for transplanting celery, cabbages, lettuce, etc. Different kinds of markers are in use, but one may be easily constructed by using a good-sized wheel, to which handles may be attached like a wheelbarrow; also a side marker to denote the rows, the tire of the wheel being provided with movable pegs, which can be adjusted at such distances as are required for the plants to be set. After properly preparing the land, the rows may be marked and also the place for setting the plants by wheeling this implement over the ground, the rows and place for setting being thus marked uniformly.



GARDEN ROLLER.

Hotbeds and Cold Frames.—There are many kinds of plants commonly cultivated in gardens, which it is desirable to start earlier than could be done in the open air, in order to secure early vegetables in the Northern and Western States, while there are also several varieties that will attain a more rapid growth and be more productive if properly transplanted, than if allowed to grow where the seed is sown. Farmers, therefore, frequently purchase some kinds of plants ready for setting, or start them in window boxes. But the latter method is very inconvenient, and the better plan is to make a hotbed or cold frame, and start the plants that are desired for early maturity, such as tomatoes, lettuce, cucumbers, squashes, cabbages, cauliflower, etc., or such plants as are needed in an ordinary garden, at little or no expense in money, and very little time or care in labor, and much sooner than if the seed were sown in the open ground.

This should be located with a southern or southeastern exposure, and in a sheltered spot, and the land be dry and level. Such frames may be of any size, according to the size of the garden, and the number of plants required. A cold frame consists of an enclosed bed of soil covered with glass. In making such a frame, four posts should be set in the ground at the corners to give support to the planks that form the sides, to which they should be nailed. The back of the frame should be about a foot high, and the front four or five inches less. For ordinary farm use, a frame six or eight feet long, and three or four feet wide, would be sufficiently large. The end pieces should be made to slope from the back to the front, and fastened evenly on so that when the sash is on there will be no cracks left for the cold wind to blow in, or the warm air to escape. The top should be made of glass set in sash, the size of the glass usually being 8 by 10 inches. Old windows will also answer every purpose for covering.

Mr. William D. Philbrick gives his method of making a hotbed as follows: "The hotbed, as used by market-gardeners, is a much more simple affair than is usually described in the books. We build a fence, facing southeast or south, using posts nine feet long, three

feet in the ground, six feet above; and set them six feet apart, leaning back eighteen inches at the top, so that the mats when leaning up against them are not likely to be blown down. Planks 2 by 12 inches are set in the fall, before the ground freezes, so as to make a frame six feet wide, outside measure, two feet from the fence, and carefully adjusted so that when the sashes are placed on them they will pitch five inches. The space between the plank is then covered with litter, to keep out the frost, and the bed can be used at any time in the winter. When it is needed for use, the loam is thrown out, and fresh horse manure put in to the depth of six to twelve inches according to the season of the year and the crop to be raised; the loam is then thrown back on the manure to the depth of six or eight inches, and covered with sash and mats, and after a few days the bed will generally be in order for planting."

The soil within the frame should be deeply spaded, — from one two feet, according to the season and the amount of heat required, — also finely pulverized. When much heat is required for a hotbed, the soil is taken out to the depth of several inches, and a quantity of fresh horse manure is put in mixed with a few leaves, and from six to ten inches of rich soil spread evenly over the manure. The frame is then covered with the sashes, and after standing a few days to allow it to ferment, and the rank heat and steam to pass off, the seed may be sown. Where the ground is well drained, it is thought by many to be a better plan to dig out a space from one to two feet deep the size of the frame, according to the amount of heat required, the season, etc., then pack the manure in firmly and evenly before covering with the soil.

Care of Hotbeds, etc. — Before sowing the seed, the surface soil should be worked so as to render it more moist and also to pulverize it. When the soil is cold and damp, the sash should be kept on for a few days before sowing in order that it may become warm. The bed should be watered a little every morning and the soil kept damp, but not so wet as to cause the seeds to rot. During warm days the sash should be raised a little to admit the air; it should, however, be kept closed during cold nights. Sometimes during very cold days, and especially nights, mats or old pieces of carpeting will be required to cover the sash, to prevent the freezing or chilling of the plants. If the plants grow too rapidly, and too slender, it shows that the air is too warm in the frame, and more air from outside should be admitted. It should be remembered that the slower growing plants will be more hardy, and that the object of the frame is not only to start the plants, but to preserve them from freezing.

A little experience will enable the person having charge of a hotbed to determine the amount of heat and air required for a healthy growth. As the season gets warmer it will be necessary to shade the glass during the hottest part of the day. Before transplanting, the plants should be gradually hardened by first half removing the sash for a few days, and afterwards removing it altogether. This may be done when the temperature is no lower than 30°, but they may be opened more or less, when below this. Some air should be given when the temperature is as low as 10°. If there should be a considerable fall of snow, it is always best to remove it from the sashes to prevent the plants from becoming too warm, and start into an unhealthy growth. But it is always safe to be prepared for a sudden change of temperature to severe cold, after a succession of mild days. In such cases, shutters, old carpets or mats, straw, marsh hay, or other litter should be in readiness to place over the sashes to protect the plants from freezing. When the plants have been well hardened, and the temperature of the season and the soil are suitable, they should be carefully removed and transplanted.

Soil and its Preparation. — The quality of the soil and its preparation has a great influence in determining the results attained in gardening. With all the other provisions made for easy and efficient cultivation, these must not be overlooked. It is true that all vegetables do not require the same kind of soil, but for general purposes, a deep, black loam,

well drained by a fine, sandy subsoil, is the best. A light soil that requires no underdraining may be easily worked, but requires more frequent applications of manure, which may be best applied in the form of compost, made of one-half loam and half manure. Cabbages, celery, cauliflowers, and such plants thrive in a rather stiff soil, while radishes, beets, lettuce, and many of the early garden crops seem to do best in a warm, sandy loam. The soil for a garden should be rich; a dry, loose, gravely soil is unfit for a garden. When the soil is naturally light and thin, the mixing of some clay will be an advantage. The best method of applying it, however, is to compost it first with manure, the clay acting as an absorbent in the compost heap. The reverse is also true, viz.: when soils are too heavy they may be improved by mixing with sand. Lands that are too wet should be thoroughly underdrained.

The soil for a garden should be finely pulverized and made friable in order to secure a speedy germination of the seeds, while, where kept so, it is one of the most favorable conditions for the destruction or prevention of weeds. The manure applied should also be well pulverized and thoroughly mixed with the soil. For all the practical purposes of gardening, well composted barn-yard manure seems to be the best material for fertilizing, although many of the concentrated manures now manufactured are valuable and convenient, especially where a succession of crops is desired. Wood ashes, bone dust, superphosphate, guano, and lime are also excellent fertilizers when the soil requires them. The site of a garden, or rather its exposure, has much to do with the early maturity of the crops, an exposure to the morning sun being desirable.

Seed. — The best seeds should always be secured for gardens, not only the best varieties, but fresh seed that has not lost its vitality by being kept too long. Seed frequently fails to germinate from being sown at an improper season, or when the soil is not in a suitable condition. Other reasons for failure may be attributed to insects in the soil that devour the germ either before or soon after it appears above the ground, — unfavorable conditions of the soil, that may cause the seed to rot before vegetating, or the germ to dry up and die, etc., — all of which conditions and possibilities should be taken into account by the gardener, and be obviated as far as possible. For a more extended treatment of this subject, see Good Seed (Vol. I, page 512).

Transplanting.—Plants are frequently lost after being transplanted from the seed bed, simply from the work not being done in a proper manner. If taken up at the right time, and with care, and without disturbing the roots, and the ground for receiving them be suitably prepared, there is no reason why plants that are transplanted should not live and thrive well. A misty day with a wet soil is the best time for resetting, the mist settling upon the leaves, freshening the plants, and giving them a good start before being exposed to the sun. When such a day does not appear, after a shower just at night, is also a good time. The soil is then wet, and the dew and shade afforded by the night will give the plants vigor and strength to better bear the sunlight. If one or two cloudy days should follow transplanting, so much the better. When it is necessary to transplant during dry weather, make a suitable hole or excavation in the ground for the roots, and fill it with water; as soon as the water soaks out, leaving the ground in a moist condition, place the roots in the opening made for them, and press the earth firmly around, it being made to come to the first leaves. If the weather continues dry, remove the soil slightly from around the plant with a hoe, leaving it in the form of a basin around the stem. Pour the water into this basin (not upon the plant to drown it), and in an hour or so after it has soaked into the soil, draw the earth over the surface and cover as before. Plants treated in this manner, even if set in a very dry time, will scarcely ever fail to live. All roots should have the place made to receive them suited to their form, and placed as nearly as possible in the same manner as before being removed,

always remembering to press the soil firmly around the roots, and to cover them well, or,—with most garden plants,—as deeply as the first leaves. The after-culture is to keep the garden free from weeds, and the soil in a friable condition by frequent stirring. When the insects are troublesome, remedies must of course be applied or resorted to for their extermination.

Market Gardening.—This consists of growing vegetables extensively, for the purpose of supplying the demand for such articles in the markets of large cities and towns. Mr. J. B. Moore, of Concord, Mass., well known as an extensive fruit-grower and market gardener says of market gardening: "It is a form of agriculture combined with horticulture, and to be carried on successfully must have, in addition to the original cost of the land, a considerable amount of capital invested in manure, glass, and structures, either in the form of forcing houses or hotbeds. And it requires more skill in the preparation of the soil, more skill in the selection and planting of the seed, more skill in the adaptation and application of manure to the different varieties of plants, and more skill and care in the preparation and marketing of the crops than is usually practiced in ordinary farming.

It is also a source of constant care to any one who carries on the business, and there exists a necessity of doing everything at the right time, no matter what the state of the weather may be, wet or dry. And there must be a constant watch kept for insects injurious to plants, so that they may be promptly exterminated, and before they have increased so as to render their destruction a matter of difficulty, or have done the garden much damage. And as compared with common farming it involves harder work, but is more profitable"

Essentials in Market Gardening, Profits, etc.—The requisites included in market gardening have been so admirably defined by Mr. William D. Philbrick of Mass., so well known as a skillful market gardener of extensive experience, that we give his opinions the preference in connection with this subject. He says: "The essential things for profitable market gardening are nearness to a good market, a good soil, and sufficient capital. A good gardener should have a natural tact for the business, which will include habits of industry, a keen, observing eye, and should have some years experience; for it is a trade that cannot be learned wholly from books and papers, but needs practical acquaintance with the many details of the work for success. Many of the failures in attempting this trade or business are due to want of capital, but perhaps more to want of the necessary experience, or of natural tact.

The distance from market will control, in a great measure, the nature of the crops that can be profitably grown. Within six miles of a large city, the manure wagon and market wagon can make two trips in a day, if needful; and this nearness gives a very great advantage where a large amount of manure must be applied to a small amount of land, and balances the greater amount of land, and higher taxes and rent, or interest, which encumber the garden near town. Many of the gardens near Boston are worth over one thousand dollars per acre. The amount of manure used on these gardens is from twenty to thirty cords per acre every year. It keeps a two-horse team going every day to draw the manure used on some grounds, of not over twelve acres, and the produce on some of the gardens will average one thousand dollars per acre per year, for the whole garden, for a term of five years. The market wagon upon such a garden makes daily trips to market, and at certain busy seasons three or four loads daily will be sent.

When the distance from market is more than seven, and less than fifteen miles, the nature of the business is changed. Land is cheaper, being worth from fifty to two hundred dollars per acre; the hauling of manure and of produce costs double or more what it does nearer market; and here it is that we find the gardeners (or farmers as they are more properly called) devoting their energies with greater profit to such vegetables as require less manure,

and are less bulky, such as early potatoes, beans, asparagus, strawberries, and other small and large fruits, squashes, late cabbages, turnips, and other roots. On these more remote gardens, the market wagon will make only three or four trips per week, in general, in summer, and two in winter. The value of the crops raised will naturally range from two hundred to five hundred dollars per acre. The amount of manure required for the good management of these farms will be from six to ten cords per acre.

The nature of the soil has much to do with a good garden. The best for general purposes is a deep black loam, well drained by a subsoil of fine sand; but it is desirable to have some variety of soil, as no one soil is adapted to produce all the vegetables in perfection. A rather stiff soil suits late cabbages, celery, and cauliflowers, while early lettuce, radishes, beets, and roots in general, as well as greens and most early crops, do best on a warm, sandy loam. If the soil is a dry, loose gravel, it is utterly unfit for any kind of gardening. Stiff clay and boggy lands, when well drained, often make excellent garden land, especially for late crops. The capital needed for gardening is larger than would be supposed by one unacquainted with the business. For gardens near market, five hundred dollars per acre is often profitably employed, invested in buildings, teams, tools, hotbeds, manure, etc.; and the force on such gardens is about one horse to every three acres of land, and in summer, one hand to every acre. On the more remote gardens a less capital and force are used, the capital ranging from one hundred to two hundred dollars per acre, and the force, one horse and one man for two to five acres.

The methods used by the market gardeners to make the most of their land are very ingenious, and deserve a more careful and extended study than can be here given; but it may be useful to notice some of the plans in use, by which they force our naturally sterile soil and fickle climate to produce two, three, and even four crops in a year, from the same land, and keep our markets supplied through our long winters with delicacies whose natural home is in the tropical zone. The crops grown upon the gardens within six miles of large cities are mostly spinach, kale, radishes, dandelions, beet-greens, beets, early cabbages, lettuce, onions, to be followed upon the same land by the late crops, which are melons, squashes, tomatoes, egg-plants, peppers, cauliflowers, celery, horse-radish, beets, carrots, parsnips, etc., The only crops which occupy the land for the whole year are rhubarb and dandelions; and some gardeners grow a crop of onion sets on the same land with their dandelions.

In the management of these various crops so as to meet a profitable sale, and also not to crowd and injure each other, the skill and experience of the gardener are shown. To accomplish his purposes many ingenious devices are used for forcing early crops, and for storing the late ones, so as to keep up an unfailing supply the year round. In general, only two crops are raised upon the same land in a season; but instances are not uncommon where three, and even four crops in a year are taken from one piece of land. Thus, winter spinach, sold in March, was followed by onion sets, melons, and celery, on the same land, all full crops; again winter spinach, sold in April, was followed by bush-beans, melons, and spinach again It would be idle to attempt such work as this without skillful use of glass and heavy manuring. The plants started under glass for field planting are lettuce, early cabbage, egg-plants, tomatoes, celery, melons, summer squashes; and some gardeners also start their beets and onions under glass, to be transplanted to the field.

The hotbed is invaluable for raising plants for planting out of doors; the ease with which the plants are aired and hardened off by removing the glass just before setting the young plants in the open air, makes the hotbed far preferable to the green-house for this kind of work. Many gardeners also raise a crop of lettuce, radishes, parsley, or carrots, in the hotbeds, before the field plants, marketing them in March, April, or May. After the field plants have been removed from the hotbeds, in March, or April, or May, and the lettuce or radishes sold, it is customary to employ the whole of the glass upon cucumbers, using a little manure to start

them. It is thus that the market is supplied with cucumbers in June before the field crop comes in. For winter work, however, in raising these crops the green-house is to be preferred; it is more manageable, and requires less labor.

The management of the more remote gardens, where less labor and manure are used, differs considerably from that of the suburban garden. The early crops are here mostly peas, beans, potatoes, sweet corn; the late ones, often upon the same land, are squashes, pickling cucumbers, and peppers, tomatoes, fall cabbage, and turnips. The hotbed is somewhat used, but less than nearer the city. The small fruits, asparagus, and dandelions, are raised in considerable quantities, and milk raising is generally an important branch of the industry of these more remote farms. The early peas and potatoes are often followed by squashes or white turnips, on the same land. Fall cabbages are also often planted after peas or early greens; and peppers are generally made to follow early lettuce. Where early potatoes or peas are to be raised with squashes, every third or fourth row of the early crop is left blank for the squashes; the squash seed planted rather late, about June 5th, and the early crop cleared away before July 10th, when the squashes begin to run. There are many of the devices of double cropping in common use in the market garden, which might be easily and profitably imitated by the amateur in his kitchen garden.

The manure used on the market garden is mostly horse manure, with some night-soil and hog manure Land intended for early cabbages and greens is usually manured in the fall with coarse manure, plowed under. The manure applied in spring is worked as fine as possible so as to be available at once for plant-food. When the horse manure is very coarse or strawy, it is used thus for hotbeds in its fresh state; but in summer it should either be thrown into a cellar to be trampled by hogs, or composted with night-soil and loam in the field. When handled in this way it does not heat excessively, and makes a manure that cannot be excelled for forcing a rapid growth of vegetables.

The preparation of the land for garden crops is a point that requires the application of considerable skill. The best gardeners plow rather deeply, ten or twelve inches; the land endures drouth better when thus handled than when shallow plowing is practiced. Many of them run a subsoil plow after the common large plow every second year, to loosen the subsoil. To make the land mellow and fine enough for most garden crops, it should be harrowed and rolled after plowing, and then plowed, harrowed, and rolled again. The roller is an indispensable tool in the garden, and is most useful in packing the surface of the soil just enough to prevent excessive evaporation in time of drouth. For this purpose it is often made to follow the cultivator in the celery field, in dry weather.

Weeds have little chance to be very troublesome in a well ordered garden. The continual hoeing and plowing kill the few that come up, and no skilful gardener will suffer them to go to seed on his land, and the manure is suffered to ferment before being applied to the land in order to destroy the seeds it always contains. The only very troublesome weeds are those which grow and mature their seeds very rapidly, such as purslain, chickweed, and the like. Even these will yield to thorough culture.

Irrigating Market Gardens.—The practice of irrigation is profitable, and likely to increase; in some seasons the rain fall is sufficient for the growth of vegetation; but we often get a month or six weeks almost rainless, with hot, dry winds, very trying to the succulent vegetation of gardens. When water is applied, it should be put on in sufficient quantity to soak the ground thoroughly to the depth of the roots; and as soon as it has soaked in, the land should be cultivated or hoed.

Frequent sprinkling of the surface is objectionable; it makes a crust upon the surface, and draws the tender rootlets to the surface, where they are likely to dry up if not constantly watered. To water land effectually requires an inch in depth applied every five days, or 27,000 gallons per acre. To apply this amount of water with an 1½-inch hose and a head of

40 feet would require about seven hours. If a $\frac{3}{4}$-inch hose were used with the same head it would require about six times as long to apply the same quantity. Where water may be cheaply had and applied there is little doubt that it will in many cases well repay the trouble. But wherever it is applied the land should have good drainage, otherwise a heavy fall of rain, coming after an artificial watering, might injure the crops. The land, if heavily manured and thoroughly tilled, will endure drouth pretty well without watering. Water, however, is indispensable to the management of the hotbed and green-house; and many gardeners not within reach of public works, or a natural head, have erected private water works, driven by a windmill or small steam-engine. In no particular is the skill of the gardener more conspicuous than in the raising or selection of his seeds.

Preparing for Market.—Another most important part of the business is the washing, packing, and assorting of the crops for market. This is usually done under the eye of the gardener himself, or intrusted only to some experienced and trusty man. It is an old maxim of trade that goods well put up are already half sold. In no trade is this more true than in the vegetable and fruit trade; clean, neat, well-washed, attractive goods always sell quickly, at good prices; while carelessly prepared stock, that is really as good, will be hard to dispose of at a fair price. The wash-house, provided with tubs, convenient benches, and sufficient shelter for the preparation of the crops for the market-wagon, is the necessary appendage of every market garden. Upon the convenient arrangement of this department much of the economy of the labor of preparing the crop depends.

Storage of Crops.—Among the noticeable devices of the market gardener for keeping the fall crops for winter use are, the squash-house, the celery-pit, the spinach-house, the cellar. Squashes, for keeping, need a tight house above ground, a dry air, and a temperature from 55° to 60°, which is maintained by a stove and by slight ventilation; they need picking over every ten days, to select the decayed ones. The celery-pit needs a dry, cool air, moderate ventilation, perfect protection from frost.

The celery-pit is usually made twenty-four feet or twelve feet wide, two feet deep at the sides, covered with boards supported by posts and purlines, and the boards covered with sufficient litter to keep out frost. The celery is dug in November, and stowed away, placing a little earth over the roots, and will keep well through the winter if well aired and cared for, airing it frequently. It needs to be kept dry, to be protected from frost, and kept as cool as may be without freezing.

The spinach-house, or cellar, is similar in appearance to the squash-house; the shelves, however, are only fourteen inches apart; as we do not need to work between them, it is made partly underground. As the temperature required for spinach is 30° to 35°, we need no stove, but good ventilators, and protection from frost by double walls, and covering of meadow hay, etc.

The cellar for storage of roots should be well drained and frost-proof, and provided with windows and doors for free ventilation in suitable weather. Apples and onions keep well in barrels in a cool, dry cellar; the other roots do well in bins piled about four feet deep, with openings in the sides and bottom for slight circulation of air, and a light covering of hay over them, to prevent them from wilting. They keep fresher if covered with sand, or earth, to prevent evaporation, but this is not generally practiced. Roots intended for winter marketing are often washed in the fall, and put in barrels and headed up, and then stored in a cool cellar. They come out fresh and clean at any time in winter when thus stored. The temperature of the cellar should range from 35° to 40°. If much warmer, vegetation and decay will result. The cellar of a house is not well adapted to the purpose, being too warm; especially if provided with a furnace for heating the house, as is often the case. Moreover, the vegetable cellar in spring is inevitably encumbered more or less with decaying vegetables, which are most unwholesome in the air of the dwelling.

Where many roots are raised for feeding to stock, and where cellar room is wanting, it will not cost very much to pit them. The pit is usually made four feet wide, by plowing the land and shoveling out the loam at each side; the roots are piled in a ridge about three feet deep, and lightly covered with straw or sedge, over which six inches of loam are placed, well beaten with the back of a shovel. When cold weather comes on, pile on enough litter to keep out frost; provide air-holes every rod in the length of the pit, for ventilation. Plow a deep furrow around the pit, to carry off surface water.

Rotation of Crops for Gardening. — Since different plants appropriate different elements or substances found in the soil for promoting their growth, a rotation of crops is quite as essential in gardening, as in the cultivation of farm crops. Care should therefore be taken that the same or similar plants should not be grown on the same soil for successive seasons. There are some exceptions to this rule, such as onions, for instance, that will sometimes thrive for successive seasons on the same land; but such instances are rare, and we believe *all* plants will do better when a change of soil is frequently made. (See ROTATION OF CROPS, Vol. I, page 107.)

Asparagus. — This is one of the most wholesome and delicious of all vegetables, and it is a matter of surprise that so few farmers cultivate it, with all the facilities for so doing. For market gardens, we know of nothing that will prove more remunerative, it being found in the markets early in the season at exorbitant prices, while all through the season of its growth it will find a ready demand at good prices. As to the labor of producing it, but little is required when a bed has once been established, and it will last for many years, asparagus beds having been known to be productive for more than fifty years. There is said to be one on the farm of Capt. Cummings, at Quincy, Mass., that is known to be more than eighty years old, and it is still thrifty and productive.

Varieties. — The principal varieties of asparagus are CONOVER'S COLOSSAL, a well-known variety of large size, tender, and of good quality; MOORE'S CROSSBRED, a new kind obtained by hybridizing the Giant improved with another fine variety; it is quite productive, the shoots large, and the flavor fine; SMALLEY'S DEFIANCE, early, productive, and of good quality, but not producing quite as large shoots as those previously mentioned.

Cultivation. — Before sowing the seeds, they should be soaked in tepid water twenty-four hours, to hasten germination. Asparagus requires a warm, rich soil, and thrives best on a deep, sandy loam. It should never be transplanted on stony land, since the stones would obstruct the tender sprouts and prevent their growing straight, and would also interfere with the knife in cutting. Sow early in spring in drills two inches deep and rows a foot apart, and keep thoroughly clean by frequent weeding and hoeing. When grown an inch or so, thin to twelve inches apart. In the following spring the plants will be ready to remove to permanent beds. These should be prepared with more than usual care, as, when once established, the plants will yield abundantly for many years. Where it can be done, the roots ought to be set not less than two feet and a half apart each way. This is a greater distance than is generally allowed; but, when the bed becomes thoroughly established, it will be found none too great. In cases where limited space renders this distance impracticable, give as much room as possible, but never have less than eighteen inches each way between the plants. Place the roots in their natural position, and cover four inches deep. A light, sandy loam, two feet deep and perfectly drained, is the most suitable. Rich, well-rotted manure, sufficient to cover the bed six inches, should be trenched into the soil to the depth of two feet, as the roots will reach that depth in a few years. During summer, water liberally with liquid manure. It should not be cut for the table during the first year, and very sparingly during the second year. The first year's shoots should not be disturbed until it is time to cut them down in the fall. The next season the bed will give a full crop, but should be annually

manured after the last cutting, and well cultivated through the remainder of the summer. On the approach of winter, cut down the stems and clear off all weeds, and cover with a dressing of manure; this should be forked in with about one quart of salt to the square rod early in the spring. Planting roots instead of seed will save a year in time. The salt serves a double purpose — that of benefiting the plants, and of keeping out the weeds.

A writer on this subject says in one of our leading journals: "He who lives in the country and has no asparagus bed has at least one sin of omission on his conscience, for which he can never give an adequate excuse. Some are under the delusion that an asparagus bed is an abstruse garden problem, and an expensive luxury. Far from it. The plants can be obtained of any seedsman at slight cost. I have one large bed that yields almost a daily supply from the middle of April till late in June, and I shall make another bed next spring in this simple way: As early as the ground is dry enough — the sooner the better — I shall choose some warm, early, but deep soil, enrich it well, and then on one side of the plot open a furrow or trench eight inches deep. Down this furrow I shall scatter a heavy coat of rotted compost, and then run a plow or pointed hoe through it again.

By this process the earth and compost are mingled, and the furrow rendered about six inches deep. Along its side, one foot apart, I will place one-year old plants, spreading out the roots and taking care to keep the crown, or top of the plant, five inches below the surface when level; then half fill the furrow over the plants, and when the young shoots are well up, fill the furrow even. I shall make the furrows two feet apart, and, after planting as much space as I wish, the bed is made for the next fifty years. In my father's garden there was a good bed over fifty years old. The young shoots should not be cut for the first two years, and only sparingly the third year, on the same principle that we do not put young colts at work. The asparagus is a marine plant, and dustings of salt sufficient to kill the weeds will promote its growth."

Cutting and Preparing for Market. — The cutting of asparagus in preparing it for market requires careful attention, since much depends upon its looking well when offered for sale. It should be cut early every morning, and tied up at once in bunches of about a pound each. The best knife that we have found for this purpose is a common butcher's knife filed with saw teeth for about three inches from the point. Such a knife will require grinding and filing daily. The cutting should be done before the heads burst, and when the stalks are six inches above the ground, they may be cut three or four inches below the surface. A simple frame is used for bunching, which greatly facilitates this operation. It consists of a horizontal board into which four pegs are driven, with another board set up on edge at the end of the first, and nailed to it. The pegs are so placed as to gauge the size of the bunches, the standard size being of a pound weight. The material for tying is Russia matting, this being wet before tying and drawn very tightly. Some little skill is required to have the bunches look well. When it is necessary to cut the asparagus the evening before marketing, the root end of bunches should be set in water to the depth of an inch or two, in order to keep the stalks fresh.

Beans. — Both bush and pole or running beans are an important adjunct to every garden, they being a nutritious, healthful, and palatable diet. The large LIMA is one of the richest beans for garden culture. It has broad, rough pods, is of excellent flavor, but is rather tender and late in maturing. It is properly a plant that requires a pole for support, although it is sometimes grown without, in case the vines are kept closely pruned. The best results are, however, obtained when poles are used. DREER'S IMPROVED LIMA is somewhat smaller than the former, but is of excellent quality, earlier in maturing, and very productive. Other fine varieties of pole beans are DUTCH CASE KNIFE, GIANT GERMAN WAX, HORTICULTURAL CRANBERRY, WHITE CRANBERRY, GOLDEN BUTTER, and SOUTHERN PROLIFIC. The latter is an

excellent bean for cooking in the pod. The pods grow in clusters, are very brittle and tender, and mature in seventy days after planting. This is one of the most popular varieties of the Southern States. Among the best dwarf or bush varieties are the EARLY DWARF, WHITE WAX, BLACK WAX, EARLY CHINA, WHITE MARROWFAT, etc.

Culture. — Being extremely sensitive to cold and frost, beans should not be planted before all danger from this source is passed. It is a good plan to start them well in a hotbed or cold frame, and afterwards transplant them in the open air. This will insure an early crop. By planting them on the reverse side of turf cut into small pieces, they can be readily transplanted without disturbing the roots. A Connecticut farmer describes this method as follows: "I take a sharp spade and go to the side of the highway where there is a wash, as the soil is pretty sure to be good, free from stone, and a close turf. I cut the turf into squares of one foot, about three inches deep, hauling these on the wagon to the place chosen for the crop. I lay them bottom up in the cold frame, and with an old knife cut each square of turf into pieces four inches square, giving nine pieces to each square. Into each of these smaller pieces of turf I stick the bean, squash, or melon seeds. I put two beans in a piece, or three melon or squash seeds. I then sprinkle soil over the bed, and when the seeds are up high enough, I take the pieces of turf with the plants, and set them where they are to grow. By this method the roots are not broken, and they grow right along. I take two squares for a hill of beans, which gives me four good plants in each hill."

This is an excellent method for planting Lima beans, since they are generally so late in maturing that they require an early start. The dwarf or bush beans are generally more hardy than the running varieties, and, as a rule, should be planted two weeks earlier that the latter. Beans succeed best in a sandy loam moderately manured, although they will do well in a variety of soils. If the soil is too rich the ground will be mostly in leaves and vines. In garden culture beans should be planted at intervals throughout the season for a succession of crops, finishing the planting about the first of July. For bush beans, make the drills two inches deep and two feet apart, planting the beans three inches apart in the drill, covering not more than two inches deep. Pole beans should be planted in hills, according to the variety, from three to four feet apart, and five or six beans to each hill. They do best when planted with the eye downward. When the plants are well established, thin out to four plants to a hill. They require poles from six to ten feet high to climb upon. The soil should be stirred often to be kept loose and friable, and for exterminating the weeds; but only when dry, since earth scattered on the leaves when wet with dew or rain will be liable to cause them to rust.

Culture of Lima Beans.—Lima beans are very susceptible to cold and wet, and are apt to rot in the ground, consequently they should not be planted when the soil is wet or cold. If planted directly preceding a shower, or before the ground has dried off after one, they will be liable to suffer from it. This variety requires much greater care in this respect than any other. It is always well to plant an extra drill for supplying the places of such plants as fail to thrive. They should have plenty of room for growth, consequently require planting further apart than other varieties. Some of the most successful gardeners plant in hills five feet apart each way, with only two plants to a hill, and one pole to each plant. Poles six feet high will be sufficient, and the runners should be picked off when they reach the tops of the poles, also all the side runners a foot away from the poles, which will cause them to be more productive, and the strength of the plant run less to vines. It is considerable trouble and labor to keep the runners back, but the additional yield thus obtained well repays. When transplanting from a hotbed, great care should be used not to disturb the roots.

Mr. W. D. Philbrick gives his method of transplanting Lima beans as follows: "The seed is planted in an old hotbed about May 1st to 10th. Under shelter of the glass the seed

rapidly germinates and grows; three or four seeds are placed for each hill in squares marked out on the bed eight or nine inches square. As planting time approaches, the plants are hardened by taking off the glass several days, and the day before planting they should be thoroughly soaked with water, so that the earth will not crumble from the roots in transplanting. This is effected by pressing into the ground, around each hill, a square ring of sheet zinc, eight inches square by three inches high, to hold the earth together, and then passing a spade under the hill, it can be lifted, ring and all, and carried to the place intended for growth. This is precisely the way in which we transplant melons and cucumbers, and by means of it gain at least two or three weeks, which in our short season is well worth while. Only a few of the rings are required, as they are taken up as soon as the hill is planted and used for the next one."

If the pods are gathered before ripening on the vines, or when green, but well filled, the beans are much nicer for winter use, than when allowed to ripen before gathering.

Beets.—The early varieties of beets are very useful for the leaves as "greens," as well as for the roots. Soaking the seed in tepid water for twenty-four hours before planting will cause them to vegetate much sooner. A deep, rich, yet rather light loamy soil which has been well manured the previous year, is excellent for beets. When an early crop is desired, the seed should be sown as soon as the ground can be worked, and the principal crop in the first week in May; but for winter use, sow as late as June. The sowing should be in drills about an inch deep, and from fifteen to eighteen inches apart. The weeds should be kept down by frequent cultivation. For further directions respecting beets, see Vol. I, page 364.

Borecole, or Kale.—This is a variety of cabbage, the leaves of which do not form into a compact head, but are generally loose and curled or wrinkled. It is more hardy than the cabbage, and is thought to be improved by the touch of frost, and makes excellent greens for winter and spring use. This plant is sown and cultivated the same as cabbage, and is sown from May to June. For early spring use, the DWARF GERMAN and GREEN CURLED SCOTCH varieties are sown in September, and protected during the winter with a covering of straw or litter. Other varieties are DWARF PURPLE, IMPROVED SIBERIAN, IMPROVED GARNISHING, and NEW RUSSIAN. SEA KALE grows spontaneously in some parts of England. Sow the seeds early in the spring in well-manured, deep tilled soil, covering about an inch deep, with rows two feet apart. Thin out the plants to six inches in the rows, and before winter cover with straw or leaves. The following spring transplant in hills three feet apart each way. Sea Kale is grown for its blanched shoots, which are cooked like asparagus.

Broccoli is also a species of cabbage that resembles the cauliflower. The principal varieties are the EARLY PURPLE, a hardy kind with compact, large heads of brownish purple color, WHITE CAPE, sometimes called "Cauliflower Broccoli," a white variety resembling the cauliflower, and WALCHEREN, also hardy and of fine quality. For early crops, the seed should be sown in a hotbed, and the plants transplanted. The plants should be set in rows two feet apart, with the same between the rows. They should be well watered until they become fairly established in the soil.

Cabbage.—The cabbage thrives best in a deep, rich soil, that has been thoroughly pulverized. It is a hearty feeder, and requires a plenty of nitrogenous manure, and also phosphates. For early use, the seeds should be sown in hotbeds in February or March, or they may be sown about the middle of September, and the plants kept over winter in cold frames. The former method is preferable where the winters are severe. Transplanting should be done in the spring as soon as the ground will admit of being worked, the plants being set in rows two feet and a half apart. They should be set in the ground up to the first leaf, no matter how long the stem may be. For winter use the seed should be sown in May

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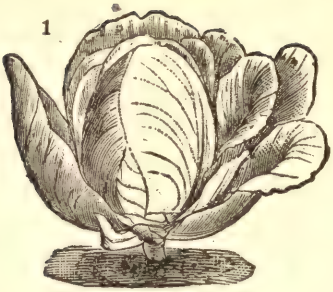

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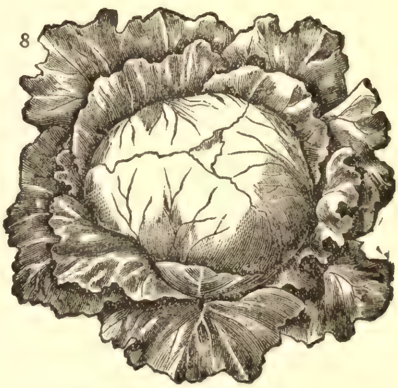


1. Early French Oxheart Cabbage.
2. Early Winnigstadt Cabbage.
3. Early Jersey Wakefield Cabbage.
4. Henderson's Early Summer Cabbage.
5. Large Flat Dutch Cabbage.
6. Drumhead Savoy Cabbage.
7. Early Improved Flat Brunswick Cabbage.
8. Large Late Drumhead Cabbage.

or June, and the plants set further apart than for the early crop, the distance being two and a half by three feet. At the South they may be set in the fall. Producing cabbage on the same soil for two or more successive years is not to be recommended, since no plant requires a change more frequently than this. The disease known as "clump root" is supposed to be in a great measure due to exhaustion of soil from repeated planting of this crop. Two or three years should intervene between cabbages occupying the same piece of land. The plants should not crowd each other in the seed bed, and should have ample room for growth in the hills or rows. The ground should be kept loose by the frequent use of the hoe or cultivator, and when the plants are fully half grown, the soil should be stirred deep, and hilled up around the stalks. Stable manure that has been well fermented should be used, also bone dust, guano, and salt. The latter applied just before the plants commence heading, will make them head up more compactly. Hog manure is generally regarded as objectionable for use in the cultivation of this crop. The cuts of the different varieties of the cabbage which we insert, also of other vegetables in this department, were copied by permission from the catalogue of W. F. Dreer of Philadelphia, Pa., and represent some of the leading varieties at present cultivated. Pyrethrum powder dusted over the cabbages will destroy the cabbage worm, and drive away the flea-beetle. It should be mixed with wheat flour in the proportion of one part of Pyrethrum to four parts flour, and be lightly dusted over the plants.

Carrots.—The garden cultivation of carrots is substantially the same as that recommended for the field, which has already been given in connection with ROOTS AND ESCULENT TUBERS, Vol. I.

Cauliflower.—This is a variety of cabbage which differs from the other varieties of its species, the parts eaten being the flower buds and stalks which form a compact mass or head. It is a delicious vegetable, and should be more frequently cultivated in the farm garden than it is at present. For sowing the seed and transplanting the same directions are recommended as for cabbage. It requires a deep rich soil, and an abundance of moisture in order to be grown in perfection. During a dry season, it will require watering artificially. Careful cultivation should be given, such as frequent and vigorous stirring of the soil, and a liberal supply of rich liquid manure in order to keep up a continuous and rapid growth. The blanching of the heads will be facilitated if the leaves are gathered loosely together and tied over the top of the head after they are fully grown. There are several varieties in cultivation, among those most early are the EARLY DUTCH, ERFURT EARLY DWARF, EARLY PARIS, EARLY SNOWBALL, and EARLY LONDON; the later varieties,—the ALGIERS, IMPERIAL, NONPAREIL, VEITCH'S AUTUMN GIANT, and the WALCHEREN.

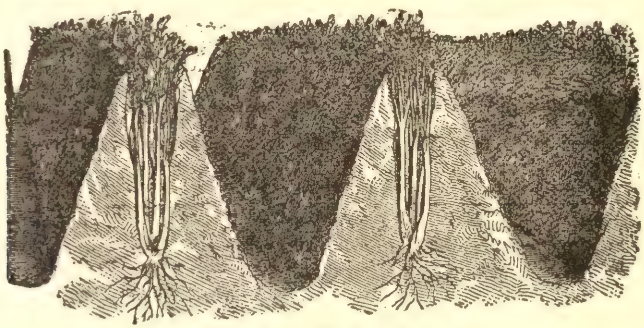
Celery.—This is a most delicious salad, and is as healthful as it is palatable, it being regarded as excellent for strengthening the nerves. With a little extra care and labor this luxury might be supplied to every farmer's table. The seeds are frequently started in a hot-bed, especially for the early crops, the plants to be transplanted as soon as they will bear handling, which is when they are from six to eight inches high. When started in the open land, a sheltered place should be selected. Two methods of transplanting are practiced, viz.: that of setting the plants upon the surface like other vegetables, and the far better one of planting in trenches. By the latter method, the trenches are dug a foot and a half deep, and about a foot wide, and the bottom filled six or eight inches in depth with manure that has been well fermented.

This should be covered with soil to the depth of about three inches, which should be mixed with the manure and pressed or trodden down slightly to render it more compact, after which there should be two or three inches of fine soil added in which to set the plants. The soil should be very rich and deep, and the plants, after being carefully taken from the seed bed, and having the suckers removed, should be planted in rows from six to eight inches

apart in the row. The trenches or drills should be three feet apart. Draw the earth around the plants as they advance in growth, but leave the hearts or center of the tops uncovered until the final soiling, care being used not to get the soil into this center of the plant. This earthing should be done when the plants are dry. Celery being a saline plant, an occasional application of salt will improve its quality. The soil should be kept loose around the plants during the season of growth, and liquid manure frequently applied. From the middle of August to the middle of September is the most favorable time for the growth of celery, the days being warm and the nights cool, with a considerable gathering of dew. A moderate or light frost will not injure celery, but whenever a heavy, killing frost is anticipated, it should be cared for; it is best, however, to leave it out as long as possible with safety.

There are several varieties of the celery plant, some of the principal being the Golden Heart, Dreer's Improved White, Boston Market, Giant White, Mammoth Red, etc.

Blanching Celery.—About four or five weeks before celery is wanted for table use, the stalks should be blanched by covering with soil so as entirely to exclude the light. This operation consists in banking up the plants with earth on each side nearly or quite to the tops,



CELERY PLANTS BANKED UP.

as shown in the accompanying cut. Market gardeners usually blanch a large portion of their celery in this manner early in the season for early sales. When celery is to be sent to market late in the fall or early in the winter, it is generally stored in trenches.

Wintering Celery.—An authentic agricultural writer gives the following methods of storing celery for winter and spring use: "Market gardeners sometimes leave the celery where it grew, banking it up to the tops with earth, and at the approach of severe weather, covering with leaves. There is the risk of being unable to get out the celery when wanted, when left thus; hence the crop for use in late winter is stored in trenches, where it is accessible at any time. The trenches must be where water will not settle in them, and should not be over ten inches wide, the depth being equal to the height of the plants. The celery is placed upright, the plants being close together, but no earth is put between them. The tops are to be covered with leaves, straw, or coarse hay, but not until the weather is likely to be severe, though the covering material should be at hand to be ready in an emergency.

To avoid injury from heating, the packing in trenches is delayed as long as it is safe to do so. But the plants in the rows are protected by roughly earthing them up to the tops three or four weeks previous. The tops will not be injured if the thermometer falls five or six degrees below freezing, and the covering may be slight at first, to be increased as the cold is more severe, until finally it is six or eight inches thick. Boxes may be used for storing celery in the cellar. This is a neat and ready way, but not practicable in a warm cellar. Instead of boxes, boards may be used. A row of boarding is placed nine inches from the cellar wall, and as high as the tops of the celery; this is to be filled with the upright stalks as if it were a trench. At nine inches from this two more rows of boarding are set up; also

nine inches apart, forming another trench, distant from the former by its own width; this is to be filled, and so on. This will leave the celery in strips nine inches wide, separated by spaces the same width. The spaces are to avoid the heating, which would take place if larger masses of it were placed together.

If the floor of the cellar is cemented or bricked, a couple of inches of the soil should be placed on it before the celery is packed. It will be necessary to use some strips or stays to hold up the boards. With a cellar bottom of earth, no soil is needed, and the boards may be held up by driving stakes. With such a mass of vegetable matter, considerable heat is given off, and free ventilation will be needed to keep the temperature low enough to prevent injury." As wanted for use, take from the end of a single trench, never leaving what is left uncovered or exposed to the light.

Chervil.—This is a plant that is used as a small salad, when young and tender; also for flavoring soups, etc. It is aromatic, and resembles parsley in appearance. Sow the seed either in the fall or spring, in drills half an inch deep, and about a foot apart. After the plants are sufficiently large, thin out to about seven or eight inches apart. Keep free from weeds, and during very dry weather water occasionally. The principal varieties are the CURLED and the TUBEROUS ROOTED.

Chicory.—The chicory plant grows wild in many parts of Europe, but is cultivated and used in this country by being mixed with coffee, the roots being first dried and roasted and then ground like coffee. It is a perennial plant, with a root resembling that of the carrot in form, but white in flesh; stem growing from two to five feet high, with a rather large blue flower, and leaves resembling those of the dandelion. When largely used, the root has a tendency to produce diarrhœa, but when mixed with coffee in the proportion of one-fourth chicory to three-fourths of coffee, the drink is considered more healthful than pure coffee, and also of better flavor. The leaves, when bleached, are used as a salad. The best varieties are the LARGE ROOTED or COFFEE, and the WHITLŒF. The seed should be sown in the spring, in drills half an inch deep, in good mellow soil, the after culture being the same as is recommended for carrots.

Corn (Sweet).—For garden culture and table use, only the sweet or sugar varieties should be grown. These should have a warm and moderately dry soil, being liable to rot in one that is cold and wet. Plant the earliest varieties first, as soon in the spring as the ground will admit, in hills three feet apart each way, six seeds in a hill, covering about half an inch; afterwards thin out to three of the best plants to a hill. Later varieties should follow, which are generally better in quality than the very earliest. The culture is the same as for field corn. There should be a succession of plantings every two weeks from April to July, in order to furnish a continual supply of this excellent food during the season.

Cress or Peppergrass.—This is extensively grown as a small salad. The best varieties are the BROAD LEAVED or common cress, the EXTRA CURLED, and the AUSTRALIAN. It should be sown early in the spring quite thickly in shallow drills. The sowings should be repeated at short intervals during the season, as it is apt to soon run to seed.

Cress (Water).—The leaves of this plant are used as a salad, and when eaten with salt, like celery, have a very agreeable, pungent flavor. The best varieties are the ERFURT and the common WATER CRESS. These plants require a stream of running water, pond, or ditch, and may easily be grown by sowing the seeds along the sides of these, where it will grow without care except to prevent the interference of weeds. Transplanting is regarded as a surer method than sowing. This may be done from March till August. The distance between the plants should be ten or fifteen inches.

Cucumbers.—These should find a place in every garden, they being a great relish for table use when fresh from the vines, or when used as a pickle. For table use the earlier

varieties should be planted, but for pickles, the later kinds should be chosen and planted during the first two weeks of June, and should be gathered when two and a half to three inches in length. There are many fine varieties, such as the EARLY CHESTER, EARLY RUSSIAN, EARLY WHITE SPINED, LONG GREEN PICKLING, etc. Cucumbers thrive best in moist, rich, loamy soil. It is a good plan to start them in a hotbed, when an early crop is desired, and afterwards transplant them when the soil is warm enough. They should not be planted in the open air until the weather is warm and settled. The hills should be made four feet apart each way, and previously prepared by mixing in each a shovelful of fermented manure or a good supply of wood ashes, this to be mixed with the soil, and slightly covered with earth. Plant about ten seeds in a hill and cover half an inch deep. When all danger from insects is passed, thin out the plants, leaving three or four of the best in each hill. Cultivate frequently, keeping out all weeds, and the soil loose about the plants. The cucumbers should be picked when large enough, and not left to ripen on the vines, as this injures their productiveness.

The Cucumber Beetle or Striped Bug.—This is a great pest to the gardener, as it generally makes its appearance as soon as the plants are well out of the ground, or shortly after, frequently destroying them entirely. For this reason, a constant watch must be kept for its appearance. Dusting the vines with one part Pyrethrum powder mixed with four parts of wheat flour will drive these bugs away. Frequent dusting of the vines with plaster dust, or wood ashes, when wet with dew, is a good preventive. Another good remedy is to put about four quarts of droppings from the hen roost into a pail of water and after it has stood about six or eight hours, sprinkle the liquid on the cucumber vines, and it will drive the bugs away, or prevent their attacks, and will also fertilize the soil. The sediment at the bottom of the pail should never be used, as it will injure the vines, and the liquid should not be made stronger than we have recommended for the same reason. A cloudy day is the best time to apply the liquid, since it will remain longer before becoming dried off.

Citrons.—The culture for the citron should be the same as recommended for MELONS, which see.

Dandelion.—This plant is found growing wild in a large section of the country, the leaves being excellent for "greens" in the early spring. The root is also very healthful, and when dried and roasted, is frequently used as a substitute for coffee. The dandelion is being cultivated at present to a considerable extent, and well deserves a place among the garden vegetables. The seeds are sown early in the spring in drills eighteen inches apart; thin out to six inches in the drills, keep clear of weeds, and the following spring they will be fit for table use.

Egg-Plant.—When an early crop is desired, the seed should be sown thickly in a hotbed, and transplanted, or in a warm, dry, sheltered place in the open ground, where the young plants will be well protected, since they are apt to be tender. When they are three or four inches high, and the weather is sufficiently warm, they should be transplanted into rich soil in hills about two and a half feet each way. Keep the ground free from weeds, and draw the earth around the plants as they advance in growth. The principal varieties are the EARLY LONG PURPLE, NEW YORK IMPROVED PURPLE, and BLACK PEKIN, all of which are hardy and prolific.

Endive.—This plant is used as a salad, and when well bleached is very palatable. It is also very wholesome. The best varieties are the GREEN CURLED, which is the most hardy of all, the WHITE CURLED, the FRENCH MOSS, and the BROAD LEAVED BATAVIAN, the latter being used principally for flavoring soups. Endive requires rather moist, well pulverized, rich soil. For early use, sow in a hotbed, or in a warm sheltered spot in shallow drills.

When two or three inches high, transplant or thin out the plants to eight or nine inches apart, and in dry seasons water freely to keep the plants in rapid growth, and consequently in a crisp and brittle condition. For a continual supply the seeds should be sown successively every two or three weeks until midsummer. The leaves may be blanched by gathering them together at the top, and tying, to hold them in this position. This should be done when they are quite dry, or they will be apt to rot. When wanted for winter use, the plants may be taken up carefully with a ball of earth attached to each, and placed close together in a dry cellar or cold frame, when it can be used during the winter as desired.

Garlic. — The garlic plant succeeds best in light, rich soil. Plant in April or May in drills fourteen inches apart, and five or six inches apart in the rows. The soil should be kept free from weeds, and when fully grown, which will be about the last of July or first of August, the bulbs may be harvested the same as onions.

Horse Radish. — This plant, the roots of which when grated are used as a condiment, is a very profitable product when grown near cities, where it finds a ready market at remunerative prices. We have known this crop to net from two hundred to four hundred dollars per acre. Besides being palatable when eaten with meats, it is a stimulant in promoting digestion, and very healthful. It is cultivated principally for its roots, which are white, and very sharp and pungent in taste, but the leaves, when young and tender, are used for "greens," or as a pot herb. The soil should be deep and rich, a rich loam being the best, although it will grow on almost any soil of fair quality. Good crops have been produced on even a mucky soil that was quite wet. The ground should be deeply plowed. This crop is generally propagated by planting pieces of the root. The planting should be in the spring, in rows about eighteen inches apart, the pieces being covered three or four inches deep. Press the soil closely around the root, and hoe often enough to keep down the weeds. It is better after remaining in the ground over winter, and is harvested very early in the spring, being plowed or spaded up, the roots penetrating quite deep into the soil. A few roots in a garden will suffice for family use.

Leek.—The leek, a plant of the onion genus, is, as an article of food, more delicate flavored than the onion, and is used in soups, and boiled with meat, etc., the lower part of the plant being eaten. It is a very hardy plant and easily cultivated. It thrives best in a light but well enriched soil. The seed should be sown early in April, in drills one foot apart, and one inch deep. When the plants are five or six inches high, they should be transplanted into a rich soil in rows ten or twelve inches apart each way, as deeply in the soil as possible in order that the neck or lower part of the plant may be blanched. Keep the ground free from weeds and draw the soil around the plants as they grow.

Lettuce. — For an early crop sow the seed in a hotbed in February, and transplant on a bed well prepared in some sheltered corner in April. The soil should be light, warm, and rich, and the seed lightly covered. The richer the soil, and more rapid the growth, the better flavored, more tender and crisp the leaves. The head varieties are the best. These should be set a foot apart each way. Care should be used not to sow too thickly where other varieties are grown. There should be successive sowings from time to time until July. An early crop may be had by sowing in September and transplanting in a cold frame, where the plants will head during winter and early spring.

Melons. — Melons thrive best on a light, warm soil that has been highly manured with perfectly decomposed compost, or manure that has been well fermented. A sandy soil thus enriched will produce excellent melons of any kind. The fertilizing substance should be well worked into the soil, in and about the hills, and the planting done when the land is quite warm and all danger from frost is passed. Soaking the seeds in lukewarm water twenty-four

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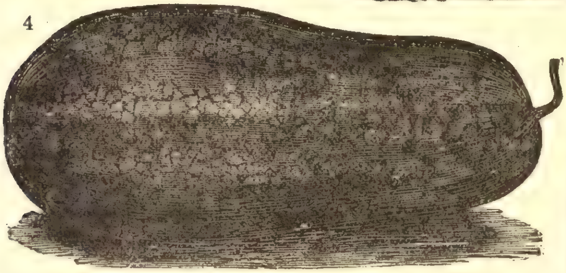

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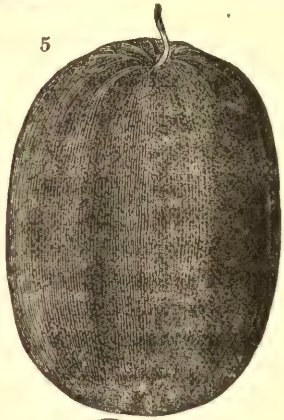

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1. Netted Pine Apple, or Nutmeg Musk-Melon.
2. Green Citron Netted Musk-Melon.
3. Jenny Lind Musk-Melon.
4. Mountain Sweet Water-Melon.
5. Black Italian Water-Melon.
6. Casaba, or Persian Musk-Melon.
7. Mushroom Bed.
8. Mushrooms Grown from Spawn.

hours before planting will hasten germination. Plant in hills five or six feet apart each way, scattering a dozen seeds in a hill, and after they are out of danger from bugs, thin out the plants to three or four to the hill. When four or five rough leaves have grown, the lateral branches or vines will start sooner if the end of the main shoot is pinched off, thus also strengthening the growth of the vines, and causing the fruit to come to maturity earlier. Citrons and water-melons require much more room for growth than muskmelons, and should be nine or ten feet apart. Keep the soil free from weeds. Pumpkins, squashes, and citrons should never be planted near musk or water-melons, as they will hybridize very readily.

Varieties of Muskmelons or Cantaloupes.—The earliest variety of the muskmelon is the Jenny Lind, a small variety of excellent flavor. Other fine sorts are the Green Citron, Bay View, Cassaba, New Surprise, Large Musk, the largest variety, Nutmeg, etc.

Varieties of Watermelons.—Among the best varieties of the watermelon are the Mountain Sweet, Cuban Queen, Long Carolina, Black Italian, Early Oval, and Black Spanish.

Mushrooms.—The value of mushrooms as an article of diet has not been fully appreciated in the United States, but in France and Germany they form an important part of the food of the people. The mushroom is wholesome and nutritious, as well as a delicious food, when properly cooked, and needs only to be better known to be more generally appreciated in this country. The *Agaricus campestris*, or common mushroom, is the only species that is generally grown artificially. It is botanically described as follows: Stipes (or stalk) two or three inches in length, white, solid, fleshy, furnished with an annular veil (a thin membranous substance encircling the stalk); pileus (cap, or edible part) fleshy, dry, convex, convexoplane, white, changing from yellowish to brownish; gills (thin parallel plates underside of the cap) free, ventricose (swelling unequally on one side), pink, changing to deep purplish brown; flesh (internal substance) white.

Mr. B. K. Bliss thus describes the culture of mushrooms: "Anyone in possession of an outhouse or cellar, or who can command a temperature of from 50° to 60°, may at any time secure a good crop of mushrooms. The best method is to procure (fresh from the stable) as much short manure as is necessary to make a bed from fourteen to eighteen inches deep, and any size the house can conveniently hold; throw the manure into a heap for a few days, until it becomes heated and the greater part of the moisture is thrown off; then spread it out for a day or two until dry and quite cool; after which put it again in a heap, and allow it to remain five or six days; it will then be fit to make a bed, which must not be deeper than stated above. As soon as the heat is about 74°, the bed is ready to receive the spawn. It requires to be broken into pieces about the size of a large walnut, and placed in the manure about two inches below the surface, and six inches apart. The bed should then be covered about two inches deep with fine, light soil, and pressed down evenly. If the temperature is right, the mushrooms will make their appearance in from four to six weeks, according to the season. After the bed has been spawned, do not water unless quite dry, and, when necessary, use lukewarm water only.

Propagation of Mushroom Spawn.—The method of propagating mushroom spawn has been definitely given by Prof. T. Taylor, formerly microscopist of the Department of Agriculture at Washington: "Summer is the best time for performing this operation. Procure some horse manure; if there is a sprinkling of short litter with it, so much the better; cow dung and light loamy soil, or road scrapings, in about equal proportions; it is not particularly necessary that they should be in exact quantities. I mention this in passing, as an idea sometimes gets abroad that unless everything is mathematically adjusted by number or weight it would be folly to expect a satisfactory result. Wash these ingredients together with water into a thick mortar, and spread it out three inches in thickness in an open shed to

dry. As soon as firm enough, cut it with a spade into squares of seven or eight inches; set them on edge, and turn them occasionally to facilitate their drying. When they will admit of being handled with safety, cut with a knife two or three holes, about two inches in diameter, little more than half through the brick, and fill each hole with good spawn,—which can be obtained of almost any seedsman,—plastering it over with a portion of what was cut out. They should now be left until quite dry. Have ready a quantity of fermenting manure, which has been well sweetened by frequent turnings. Spread a layer of this six or eight inches in thickness, and build the bricks on it with the spawned side uppermost, drawing the pile up to a point; then cover the whole with warm manure. A genial warmth of about sixty degrees will be sufficient to cause the spawn to run through the whole of the bricks. When this takes place, the process is ended. The brick can be laid aside in a dry place, and the spawn in them will keep good for years."

Mustard plants are frequently used as a small salad, and for "greens," which are excellent, as well as for the seed. The varieties are the Black or Brown, White, and Chinese. Sow thickly in shallow drills, eight inches apart, early in the spring, when grown for salad or "greens." When grown for seed, see directions for field culture of this crop in Vol. I.

Nasturtium or Indian Cress. — There are two varieties of this plant, the tall and the dwarf. It is cultivated both for use and ornament. The seed pods and foot stalks are gathered when green, and pickled in vinegar, and the leaves for mixing with salads. The flowers are of a beautiful orange color. The seeds should be sown in drills about an inch deep, in light, rich soil. The tall variety may be trimmed on brush, trellises, or fences, and the dwarf in beds, for which they make a beautiful ornamental border.

Okra or Gombo. — The young green capsules or pods of this plant are used for seasoning soups, stews, etc., to which they impart a rich flavor. The seeds should be sown in rich soil, as soon as the ground has become sufficiently warm, in hills or drills three feet apart. Thin the plants to three in a hill, or ten inches apart in the drills. The seeds should be planted rather thickly, as they are liable to rot in the ground. Cover an inch deep, and hoe frequently, bringing the earth up towards the plant to support the stems. The young pods can be gathered and dried for winter use, and the ripe seeds are sometimes used as a substitute for coffee.

Onions. — See directions for this crop in Vol. I, department of Roots and Esculent Tubers.

Parsley. — The leaves of this plant are used principally for garnishing dishes of meat for the table, and for seasoning soups. Among the different varieties most cultivated are the Double Curled, Dwarf Curled, Moss, and Fern Leaved. If the seeds are soaked in warm water for twenty-four hours before sowing, it will hasten germination, as they are quite slow in this respect, and do not appear above ground frequently in three or four weeks. A rich, mellow soil is preferred for the cultivation of this plant. Sow early in April in rows one foot apart, and cover half an inch deep. Thin out the plants six inches apart in the rows, and keep free from weeds. Water in dry weather. To have parsley green during winter, take up the plants carefully with plenty of soil about the roots, and place in a light cellar, treating the same as in open culture.

Parsnips. — See the same in the department of Roots and Esculent Tubers.

Pease. — No farm garden is complete without a good supply of pease, they being one of the most delicious, as well as nutritious, of garden vegetables. The early kinds should be first planted as soon in the spring as the ground will admit, and a succession of some later varieties every two weeks, in order to have a constant supply. The early kinds are not as

large or as rich in flavor as some of the later varieties, but, coming early in the season, they are vegetables that could not well be dispensed with. The varieties are too numerous to mention; among the best might be mentioned the CHAMPION OF NEW ENGLAND, CHALLENGER, MARROWFAT, BLACK EYE, PRIDE OF THE MARKET, and the SUGAR DWARF, the latter having edible pods and used in a green state, the same as string beans. Soil for pease should be moderately rich; otherwise the growth will be too much in vines, with a light crop of pease. Fresh manure should never be used, but that which has been well composted. The dwarf varieties are usually planted in double rows from three to four feet apart, and bushed when from four to six inches high. They should be planted rather deep, especially if the soil is dry, as they are thus made more productive, the vines lasting later in the season. The larger and later sorts do better to be planted a greater distance apart than the dwarf kinds, leaving a broad space for low-growing vegetables between the rows. Keep free from weeds, and the soil loose and friable. In cultivating, draw the earth up around the stalks; they should be earthed up in this manner three or four times during their growth. If the soil is dry at the time of planting, soak the seed in tepid water twenty-four hours before putting in the ground. During a dry season, watering will be a great benefit.

Peppers.—Being rather tender plants, and late in starting, it is better to sow peppers in a hot-bed in March, or in a bed in a warm, sheltered place early in May, and transplant in good rich mellow soil; or the seed may be sown in the open ground, when all danger of frost is passed. The plants should be set in rows sixteen inches apart, and the same distance apart in the rows. The largest growing varieties may perhaps require a little more space than this. Cultivate frequently, keeping out the weeds, bringing the earth up around the plants a little in one or two hoeings.

Potatoes.—A few potatoes of the earlier kind, should be planted in every farm garden; also sweet potatoes in those sections where they will succeed. For directions respecting the culture of this crop, see department of ROOTS AND ESCULENT TUBERS, Vol. I.

Pumpkins.—The pumpkin is principally cultivated as a field crop for dairy purposes, the large and coarse growing varieties being generally planted for that purpose. There are, however, a few of the small varieties that are cultivated for culinary purposes, such as the making of "pumpkin pies," so famous in the days of our forefathers, and which at the present time have unfortunately become nearly superseded by the squash. The best varieties for this use are small in size, and deep yellow in color of flesh, which is fine-grained, sweet, and of excellent flavor. In field culture the practice is to drop two or three seeds in every second or third hill of the corn-field, but when cultivated separately on a large scale, or a few plants in the garden, the seed should be planted in hills eight feet apart each way, three plants to a hill, and treated in the same manner as recommended for melons and cucumbers.

Radishes.—In the cultivation of radishes the soil should be very rich, light, and mellow, since their value depends principally upon their rapid growth. Sow in drills ten inches apart, and thin to two inches in the rows. For very early use in spring sow in a hot-bed in February, and in the open air as soon as the ground can be worked, sowing at intervals of ten or twelve days as long as wanted. The turnip-rooted and olive-shaped are best for summer sowing. The winter varieties should be sown in August, and be taken up before severe frost, and stored in a cool cellar or pit, where they will keep fresh and tender all winter; but before being used, they should be placed in cold water for an hour or two. As soon as the first leaves appear after sowing, dusting with soot, wood ashes, or air-slaked lime will save them from the black cabbage and turnip fly.

Rhubarb.—This plant is indispensable to every good gardener. There are two very fine varieties: the VICTORIA, which is the largest and best, and the LINNÆUS, a large, tender,

and early kind. It may be grown from seeds or pieces of the roots, the latter saving two years time. When seeds are sown, they should be put in drills eighteen inches apart and covered with fine soil. When the plants are strong enough, thin out to six inches in the rows. In the following spring transplant the roots into deep, rich soil three feet apart each way. The stalks should not be cut until the third spring after sowing. The best way is to plant pieces of the roots, which will produce stalks that may be used in one season. Give frequent cultivation, and cut out all the seed stalks as soon as they appear.

Salsify or Oyster Plant.—This is a fine vegetable that is cooked the same as carrots, or, after being boiled, is fried like oysters, which it much resembles in flavor. The culture is the same as that recommended for carrots and parsnips. It is a hardy plant, and may remain in the ground all winter for early spring use. It succeeds best in a light mellow soil, that has been well enriched and tilled quite deep.

Spinach.—This is an important crop for the market gardens, and should be cultivated in every farmer's garden, as it furnishes excellent "greens" that resemble in flavor the leaves of the beet plant. There are many varieties, the ROUND-LEAVED VIROFLAY being of the most luxuriant growth, and the NEW ZEALAND and PRICKLY or FALL variety being the most hardy and of excellent quality, although the latter is not as productive or as large-leaved as the others mentioned. The New Zealand endures the heat and drouth of summer the best of any. For spring and summer use, sow as early as practicable in the spring, in rich, mellow soil, either broadcast or in drills one foot apart, and every two weeks for a succession. Drill sowing is to be preferred, as it admits of after culture. As it grows, thin out for use, keeping it clear of muck. For winter and early spring use, sow in September in rich, well-manured ground; in fact, the soil cannot be too rich, since the richer the soil the more delicate and succulent will be the leaves. As cold weather approaches cover with straw, and remove it early in the spring. Spinach, when properly cared for, may be had for use during nearly all the year.

Squash.—The squash plant is very sensitive to cold, and should therefore not be planted in the Middle and Northern States until after all danger of frost is past. There are many excellent varieties, both winter and summer, and new ones are constantly making their appearance. The land should be made very rich, and plenty of room should be given the thrifty growing vines The hills should be at least ten feet apart. Deposit the seed when the soil is warm, using plenty of seed, thinning out to two or three plants in a hill after they have commenced growing well. Dusting the vines with Pyrethrum powder, plaster, soot, wood ashes, etc., as recommended for cucumbers, will aid in driving away the beetle or bug. The vines should be closely watched in sections where the maggot proves destructive. The eggs from which it is hatched are laid on the stem near the root, and at the base of the leaf stem, or point of union of the leaf, stalk, and vine. The maggot bores into a vine, eating its way through the pith, and if left undisturbed for a few days, will frequently destroy a large vine. When detected in season, the worm may be killed with a sharp-pointed wire; but the better way is to guard against the bugs in the first place, and, if possible, prevent them from laying their eggs in the vines.

Tomatoes.—The tomato has become one of the most important of garden vegetables, and may be canned and used in many ways throughout the entire year. It was formerly grown in gardens simply for ornament. Sow the seed in hot beds or boxes of earth in the house, placing the box in a south window where the warm sunshine will aid in starting the young plants. Plant out in the open air in a well-prepared bed, as soon as all danger of frost is passed. Set one plant in a hill, the hills to be four feet apart each way. The soil should be made rich with well decomposed manure mixed with it. Water the plants freely at the time of transplanting, unless it be in misty or rainy weather, and shield from the hot

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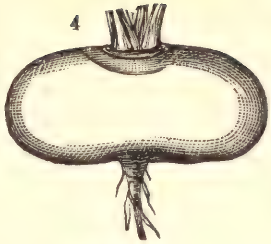

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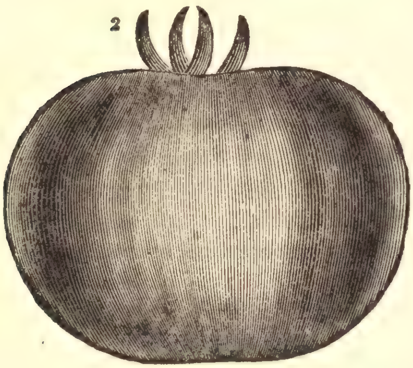

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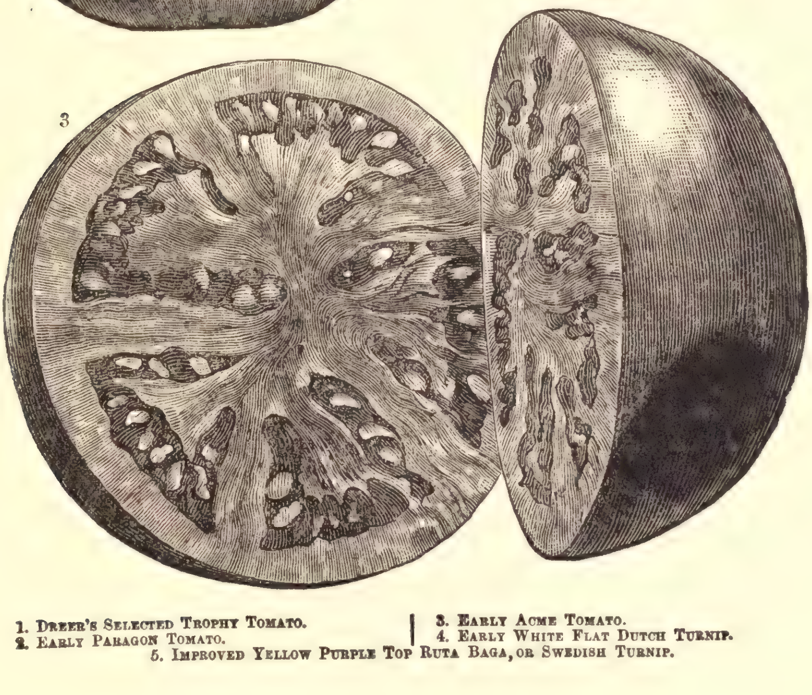


1. Dreer's Selected Trophy Tomato.
2. Early Paragon Tomato.
3. Early Acme Tomato.
4. Early White Flat Dutch Turnip.
5. Improved Yellow Purple Top Ruta Baga, or Swedish Turnip.

sun for two or three days. By pinching off the side branches, the fruit will mature earlier. The vines should be trained on a trellis, or tied to a stake, since this will increase their productiveness, and improve the quality of the fruit, and also keep the fruit from lying upon the ground, where it will be liable to rot. Frequent culture should be given, and the vines allowed plenty of room for spreading. Among the large varieties best for cultivation are the ACME, MAYFLOWER, LIVINGSTON'S FAVORITE, ARLINGTON PARAGON, LARGE YELLOW, etc. Among the small varieties for pickling or making preserves are the STRAWBERRY, a small tomato of a pleasant strawberry flavor, excellent for preserving like plums, with the addition of a little lemon juice; the RED CHERRY, YELLOW CHERRY, and YELLOW PLUM.

Turnips.—It will be found convenient to grow a few turnips in every farm garden. The culture should be the same as that already recommended for growing this crop in the field. (See Vol. I, page 358.)

Garden Herbs and their Cultivation.—A few of the most useful herbs, such as those for flavoring soups and meats, and for medicinal purposes, etc., should be found in every garden. They require but little care and room, and are a great convenience, some kinds being a necessity in every household. Some are perennial, and when once obtained, may be preserved for years with but slight attention. Sow the seeds as early in the spring as the ground will admit, in shallow drills, a foot or more apart, according to the room required for the plants to grow, and when a few inches high thin out or transplant. They should be harvested at the proper time, which is on a dry day, just before they come into blossom. They should then be quickly dried in the cool shade, and packed in dry boxes or other receptacles, excluding them from the air as much as possible, as exposure to it causes them to lose much of their strength.

The principal garden herbs are HOARHOUND, LAVENDER, SAFFRON, SAGE, SUMMER SAVORY, SWEET MARJORAM, WORMWOOD, and THYME. CARAWAY, DILL, and FENNEL are also desirable garden plants, and may be cultivated with but slight attention. Of those mentioned, caraway, fennel, hoarhound, lavender, sage, and wormwood are perennial. In localities where the winters are very severe the fennel roots will be liable to freeze, and should be taken up carefully and put in a cool cellar with moist earth packed around the roots, to prevent them from drying up. Set out early in the spring, in rich, deep soil.

Sage is the most important of the garden herbs. The seed may be sown in drills from fifteen to twenty inches apart, in a warm, rich, and finely pulverized soil, and covered about an inch deep. Thin out, if too thick, when the plants are a few inches high, or transplant. Keep out the weeds by frequent hoeings. They are perennial plants, consequently will live through the winter, if the ground is rather dry. Every spring the plants should be taken up, separated, and reset in a freshly prepared bed. The stems should be cut just before blossoming, and spread in the cool shade to dry. If seed is desired, permit a few of the strongest and most thrifty plants to blossom for that purpose. The seeds will be black when fully ripe.

Gardening for Farmers' Wives and Daughters. — Although farmers' wives and daughters are generally busily occupied with household duties a large portion of the time, and therefore do not lack for exercise in this respect, — in fact, too many of them are overworked and have but little leisure, — still, the majority of them could not only find healthful but pleasant occupation by spending a few moments each day in out-door exercise, and nothing is better for this purpose than gardening. American women, as a rule, are much behind their English sisters in respect to out-door exercise, and consequently have less constitutional vigor. Much can be done by the farmers' wives and daughters in not only having a plenty of beautiful flowers and delicious fruits continuously during the entire season, but nice vegetables also, while there will be found much more pleasure in this employment and

no small amount of profit in robust health and vigor, as well as in the material products of such labor.

A recent writer says: "I know a lady whose sensible doctor told her, twenty years ago, that she was half gone with consumption, and that her only chance of life was to be in the open air as much as possible. She accordingly commenced cultivating her garden, and a perfect bower of paradise was her little yard. Was the soil poor, she enriched it. Were her varieties indifferent, she procured better. Nearly all the flowers were fragrant. Fifteen kinds of roses bloomed under her hands, and a succession of flowers filled out the summer. One side of the yard was covered with grapes. Peaches, plums, and raspberries were trained *en espalier*, and choice squashes ripened on the roofs of the outhouses. Tomatoes were trained to single poles and yielded luxuriantly; and ruby strawberries peeped out even from the bleaching grass. She herself was as fresh and vigorous as you could expect one to be whose half-decayed lung had left her with insufficient vitality; but her life was saved, and it has been a happiness to herself and a blessing to others. She is right, too, when she says that more than half the credit for the ornamentation of our dooryards and homes is due to the ladies who urge the men to do their duty in this respect."

PART VI.

BEES AND THEIR MANAGEMENT.

IN all ages of the world's history, honey bees have been held in high esteem, and honey as an article of food regarded as a luxury. Aside from the sweet product which they manufacture, there will ever be much interest associated with the study of the peculiar habits and wonderful instincts of these little insects; hence, bee-keeping, as a pursuit, is one of the most attractive of employments, and when properly managed, is also very profitable. Any farmer could keep a few swarms of bees, sufficient to furnish a good supply of honey for home use, and these would require but very little care; but it is quite essential that this attention be given at the proper time. By a little forethought, however, this can be so managed as not to interfere with the regular occupation. To be a successful apiarist and conduct the business on an extensive scale, requires close observation, patient and persistent effort, and promptness to do whatever is necessary to be done without delay. It would be well for the apiarist to commence with a few swarms at first in order to acquire familiarity with the business by actual work and observation among them; he should also be aided by the most authentic writers on the subject, and thus acquire all the practical information possible. His colonies will soon rapidly increase, even without any other additions, and he will find it a paying as well as interesting and pleasant employment.

Natural History of Bees. —The honey bee belongs to the order *Hexapods*, or true insects, and the sub-order *Hymenoptera*, which includes wasps, etc., such insects as have a tongue for taking liquid food and strong jaws for biting. The honey bee belongs to the family *Apidæ* which comprises all insects that feed their larvæ on pollen and honey. The larva of the bee is a footless, maggot-like grub, which is fed on honey and pollen. It has been ascertained that the egg which would otherwise produce a working bee, may be changed during its growth by the workers, when necessary, to a queen. This is done by feeding with a peculiar kind of food which seems to be more stimulating than that fed to the ordinary bees. The mother bee or queen, lays all the eggs from which the colony is hatched, her eggs producing workers, commonly called "neuters," drones or males, and queens.

She lives several years, but the working bees do not survive more than one year, and the males are destroyed at the end of the first summer's growth. The queen bee, unlike most insects, deposits eggs ten or eleven months during the year in temperate climates; although in a climate where the winters are very severe, the season of depositing eggs would be somewhat shorter. When the eggs are about to hatch, the bees seek industriously for that kind of nourishment suitable for the food of the larvæ. This consists of pollen, with a proportion of honey and water that has been perfectly digested in the stomachs of the bees. The egg is hatched, when kept in a proper temperature, in about three days, and the larva, which resembles a small white worm, lies coiled up in the bottom of the cell. The bees feed it with the greatest care. In the course of five or six days it has attained its full size, and nearly fills the cell in which it is confined. It now ceases to eat, and the bees close up the cell with a covering of wax-like substance. For the next thirty-six hours the larva is busily engaged spinning its cocoon, and in three days more it enters the pupa state. It is now white, and the head, wings, legs, and every other part of the future bee may be distinguished through its transparent cocoon. In the course of seven or eight days it tears or bursts its covering, and emerges from its cell a perfectly formed bee. This is all accomplished in twenty-one days after the egg is deposited in the cell by the queen mother, or twenty-five days after the time the eggs were laid. The drones or males, however, require four days longer. As soon as the young bee is thus emancipated from its cell, its guardians or nurses gather around it, caressing it with their tongues and giving it all the food it will eat. They then clean out the cell it has vacated, except leaving untouched a great portion of cocoon or web, which serves to bind the sides of the comb more firmly together. When it quits the cell, the young bee is light gray in color. For several days afterwards, frequently a week or two, the working bees occupy themselves inside the hive mostly, and will not be seen flying about much, they being busily employed as nurses to the young hatched bees.

Every swarm or colony of bees is composed of three different kinds, which constitute, to all appearance, that number of different modifications of sex, viz.: the queen, the workers, and the drones.

The Queen Bee.—The queen is the only perfectly-developed female in the hive, and is consequently the mother bee of the colony, although she was called the king by Virgil, Pliny, and also many other writers as late as the last century.

In the propagating season she is constantly employed in laying eggs, the number averaging from one thousand to two thousand per day. Berlepsch once possessed a queen bee that laid 3,021 eggs in twenty-four hours by actual count, and in twenty days had deposited 57,000. This bee continued prolific five years, and must have laid during that time, at a low estimate, more than a million eggs. By such energetic measures, on the part of the queen, the colonies are kept populous. But this instance ranks somewhat above the average, both in the number of eggs laid and the age to which the queen retains possession of her full powers, the usual age to which she remains thus useful being about three years, although it is not uncommon for a queen to live to the age of four or five years, the period depending largely upon the natural vigor of the stock. In respect to longevity the queen differs widely from the others of her colony, none of the drones and workers surviving through the year. She is easily distinguished from the others by her larger size and greater length, the abdomen being quite long in proportion to the remainder of the body, while the wings are relatively shorter than those of either the workers or drones, and reach only a little more than half the length of the abdomen. Her mandibles are weaker than those of the workers, and her tongue or ligula, as well as the labial palpi and maxillæ, are considerably shorter. Her eyes, like those of the working bee, are smaller than those of the drone.

QUEEN BEE.

WORKER.

DRONE.

She is provided with a sting, like the workers, although it is much longer, and resembles that of the bumble-bee in being curved. Like that of the latter also and the wasp, it has but few projections pointing backward like the barb of a fish-hook, which prevent its withdrawal when it is once fairly inserted. The sting of the workers has seven prominent barbs on each side, while there are three on those of the queen. There is generally but one perfect queen existing at one time in each hive, and she seems to be treated by all the others with marked affection and deference. If an extra queen should be introduced into a hive already supplied. the two rivals would meet in mortal combat and fight until one was killed; the survivor would then be received as the accepted sovereign of the hive.

There is so much jealousy displayed by the queen of the hive towards others of the sex that, when the pupa of a future queen is sufficiently developed to emerge from its imprisoned cell, it is often prevented from so doing by a guard who hold their royal prisoner in bondage until after the queen mother has left the hive to conduct a swarm forth, thus removing all danger. In order to prevent the young queen from escaping her cell in such time of danger, the workers sometimes strengthen it with an additional covering of wax, perforating it with a small opening, through which she can thrust out her tongue to be fed by those that

guard her, and keep the queen mother at a distance. She constantly utters a kind of plaintive, piping cry, that can be readily distinguished from the other sounds of the hive, and which often seems to be answered by the mother queen, who will endeavor to get at the cell and destroy her if possible, by stinging. This the workers seem to understand, and whenever there is a prospect of a swarm being about to issue from the hive, they will concentrate about the royal cells, and prevent the old queen from getting near them, even beating and fighting her off, if she endeavors to get too near. But when the swarming time is over, or the circumstances are such that there is no prospect of another swarm being sent out during the season, the bees will not take measures to prevent the old queen from appeasing her wrath and jealousy in the destruction of her prospective rivals, which she accomplishes without mercy, with her poisonous sting, until one after another, the inmate of every royal cell is lifeless.

After the old queen has taken her departure with the first swarm, the young unhatched queens are permitted by those that guard their cells to emerge at intervals of a few days in order to prevent their meeting and destroying one another, as they would do at once if the opportunity presented, for a young queen as soon as hatched, seems to be anxious to get rid of every rival, and will not only endeavor to kill any other queen in the hive, but will even attack the cells of the royal unhatched brood in the same manner as an old queen, if not prevented by the bees that guard them. When the season for swarming is passed, the vigilance ceases in a great measure, and if two queens should happen to emerge at the same time, and meet in deadly conflict, it is said by those who have studied closely the habits of these insects, that instead of seeming to prevent the battles, the other bees appear to excite these combatants to renewed attacks against each other, and will surround and bring them back to the contest if they show any disposition to retreat or recede from each other, and when either of the queens shows an inclination to approach her antagonist, all the bees forming about them instantly give place to allow her sufficient room for the attack; also that the first use which the victorious queen makes of her power, is to destroy all her future rivals in their cells, while the other bees which are spectators to the scene, share in the spoil by greedily devouring any food which may be found about the pupae, and will even turn cannibals by sucking the fluids from the bodies of these unhatched queens before they drag them out of the cells. The life of a queen is from two to four years, the most prolific period being the first two years. A young queen is more liable to produce a working progeny, and an old one drones.

Working Bees. — The workers were formerly supposed to be of the neuter gender, and are commonly called neuters; but it has become a fully established fact that they are undeveloped female bees, and are hatched from the same kind of eggs or larvæ that the queens are, these eggs being capable of producing either a queen or worker, according to circumstances, the quality of the food, size of cell, etc., making the difference. These workers perform all the labor of gathering honey, bee glue, pollen, secreting wax from honey, constructing combs for honey and cells for hatching the young, feeding the young bees when hatched, keeping the hive clean by carrying out the offal and their dead companions, as well as keeping guard and combating any intruding enemy that may venture near.

Average Life of Working Bees. — The working bees live only a few weeks, so that a hive is repeatedly renewed from the hatching of the eggs of the queen. These little insects live from sixty to ninety days. In winter, when they are dormant, the time does not count, and one of the objects in breeding is of course to lessen the time between the fall and the spring, or to secure as early spring broods as possible.

A Western apiarist gives the result of his experiment to ascertain the length of time bees live during the working season, thus: "I had a stand of the little black bees of the genuine stingers, and on the morning of May 30th I killed the queen, and by carefully looking through their hive I found one black drone, and destroyed that in the evening of the same day. I put in a cell for a yellow queen on the 2d of June. She was hatched out, and there were a few yellow bees in the hive on the 30th, in just twenty-one days from the time her first eggs were deposited. On July 7th a few yellow bees were to be seen playing around the hive; and on the 13th day of July, just fourteen days from the time the yellow bees were hatched out, a few were seen at work with the black bees. Now any one can see that if the yellow bees hatched out in twenty-one days, the last black bees were all out by the 20th of June; and if the yellow bees went to work on the 12th of July, the last of the black bees must have gone to work on the 4th of July, making fourteen days from the time they were

hatched, unless one will go to work sooner than the other. This stand contained nothing but black bees when the black queen was destroyed, and on the 18th of July, just forty-nine days from the time the black queen was destroyed, there was not a black bee to be seen about the hive. I opened it. Not one was to be seen inside. Now I know that the bees will live longer at any other season of the year, and thought this would be a good chance to test the height of the working season. The hive was examined every day during the whole time, so that no mistake might be made."

Prolific Workers, etc. — A few prolific workers are occasionally seen in a hive, but this circumstance is rare, and is accounted for by Huber from such having passed their larva state in cells contiguous to the royal cells, or those from which the queen bees were hatched, and that they may at some early period have eaten a portion of the jelly that was the especial food of the royal brood, their ovaries thus receiving a partial development. This accounts for the production of eggs in a hive that is destitute of a queen — a circumstance that sometimes occurs, and which is thus readily explained. Such eggs as are hatched from workers always produce drones. The number of workers in a hive will range from 1,500 to 4,000 or more, a good, strong colony generally averaging about 3,500 in number.

Drones. — The drones are the male bees of the hive, and seem to have no other duty except that of impregnating the queen once, thus rendering a large portion of her eggs fertile during her life. This impregnation takes place in the air — never in the hive — the drone being at the time always mutilated, falls to the ground, and dies. Huber states that the probable reason for so large a number of drones in every hive is the necessity of the aërial impregnation, and that there may be a sufficient opportunity of the queen meeting some one of the number when she makes her aërial flight for this purpose. After the impregnation of the queen takes place, she returns to the hive, which she never leaves again except with a young swarm; the workers then destroy all the drones in the hive, and carry from it every dead body that remains after the conflict. They even destroy, at the same time, all the male eggs and larvæ, tearing open the cocoons for this purpose. This usually occurs in June, July, or August. When, however, a hive is deprived of its queen, the drones are permitted to live frequently through the winter. After getting rid of the drones, which consumed a large portion of their provisions, the working bees busily employ themselves in collecting a supply of honey and pollen for winter use, they seeming to realize that the feeding of the useless mouths of the lazy drones was attended with more needless expense than advantage to the bee public. The usual number of drones in a hive is from 200 to 300, but it is quite safe for the bee keeper to leave less than half that number to insure the impregnation of the young queens. An unimpregnated queen will lay eggs producing all drones, but after impregnation she can lay eggs that will produce either working bees or drones, seemingly at will, although various theories are entertained respecting the real cause of this phenomenon.

Varieties of Bees. — The domestic honey bee (*Apis mellifica*) is supposed to be a native of the Eastern Hemisphere, although it is now found in nearly all parts of North America. It was not, however, known here until introduced from that source. It is easy to see how readily this insect would escape domestication, and rapidly spread throughout the entire continent by the natural process of swarming. The honey bee is doubtless modified more or less by the climate of the regions where carried, yet how far this modification may be extended remains an unsolved problem. If, as is the case with domesticated animals, important modifications may be secured, and a honey bee produced that shall not only possess qualities of prolificacy and vigor even beyond what we now have, but also with such an increased length of tongue as to reach to the hitherto sealed sweets of the red clover, the possibilities of the honey harvest would be doubled. The varieties of the honey bee best known are the Black or German, the Italian or Ligurian, the Cyprian, and the Syrian.

The Black or German Bee. — This variety, as well as the Italian, was known in the time of Aristotle, 400 years before Christ. It was introduced into this country at an early period of its history, is of medium size, and about the same color throughout — that of a grayish black.

The Italian variety is so called from the fact that the first importation of it was from Italy. When pure-bred it is distinguished by three bright yellow bands at the base of the abdomen. When mixed with other varieties, these bands are not generally very pronounced. The principal characteristic of this breed is mildness of disposition and great vigor; hence they are easy of management, and will protect their hives from robbing-bees

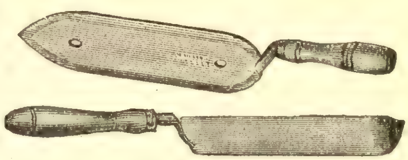
and the bee moth with great energy. They are so gentle that, after a little experience, any one can handle them without fear of being stung. They breed faster, and, being larger than the common or German variety, have longer tongues, which enable them to reach to the honey deposit of certain flowers not reached by the latter; they will, therefore, gather much more honey during the season than the common variety. Mr. W. S. Blaisdell, of Randolph, Vt., a successful and extensive apiarist for many years, says: "The Italian bee has become very generally known, and the leading apiarists have pronounced very emphatically as to its superiority over the common variety. These bees adhere with great tenacity to their combs, and go with much reluctance into the surplus boxes, especially when these boxes are not at the nearest possible point to their brood. In this respect they are unlike the blacks, and those who have been successful with the latter are not always careful to note this disinclination of the Italian, and, careless of what their instinct demands, fail to reap the benefits of their superior capacity."


ITALIAN BEE.

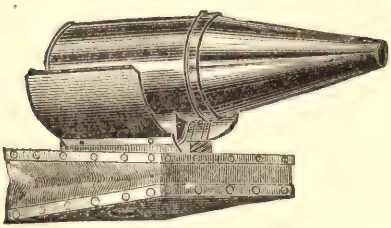
The Cyprian variety, from the island of Cyprus, and the SYRIAN, from the mountains of Lebanon, resemble the Italian very closely, being marked quite distinctly with the yellow bands. They differ from the Italian in disposition, especially the Cyprian, being of strong, nervous temperament, and apt to be very combative in disposition when disturbed. They are, however, more prolific in late fall breeding than the German or Italian, furnishing a stronger colony of young bees to endure the winter. They have a swifter flight and longer tongues than the German or common black variety, and also seek the surplus boxes fully as readily as the latter. Hybrid bees are apt to be cross and vicious in disposition.

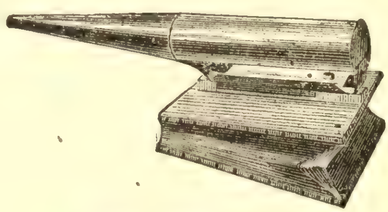

BEE VEIL.

Implements Essential for the Apiary.—In bee-keeping, as in any other business, certain implements are essential. The first requisite in the apiary is a good hive, and the very best should be secured. A bee-feeder is also a necessity for every hive; one should be procured that does not drip, and which can be filled without disturbing the bees. A bee-veil will be found of great convenience for the novice in the business in handling the bees in swarming time, etc., but the apiarist of long experience will scarcely require this protection. A honey knife for taking the honey from the hive is also very essential, although any well-tempered, thin knife will answer the purpose. Where honey is made in small, movable frames, the honey knife is not essential.


HONEY KNIVES.

A good bee-smoker is a very serviceable implement, and is really a necessity where bees are kept on an extensive scale. These implements are used for subduing bees by fumigation, when necessary to handle them or to remove their honey from the hive; also for causing parts of different swarms to unite when desired. A few puffs of smoke from any of the modern bee-smokers will quiet and subdue the most angry and combative swarm of bees in a few moments, so that they may be manipulated at will without danger to the operator.


BINGHAM'S BEE-SMOKER.

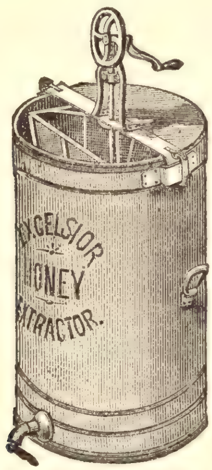

NEW BELLOWS SMOKER.

Bingham's Bee-Smoker, manufactured by A. H. Newman, Chicago, Ill., has extra wide shields for protecting the hands and bellows from heat, and obviates the danger of burning

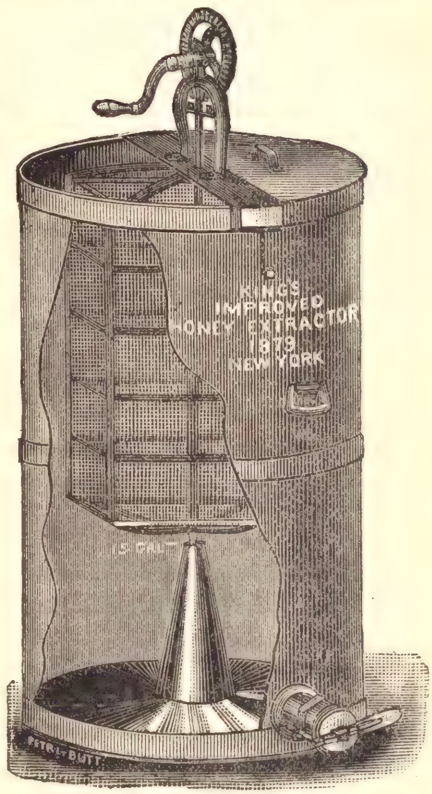
the fingers. The New Bellows Smoker, made by A. J. King & Co., New York, is one of the largest implements of this kind, consequently will burn a long time. There is no solder about it; consequently no melting or loosening of the joints. The ventilator is self-acting, and so constructed as to prevent all back suction; consequently no fire or ashes can get into the bellows A honey extractor is an implement more essential to the professional bee-keeper than the farmer, and will be necessary only where a large number of colonies of bees is kept.

There are centrifugal machines for extracting the honey from the comb, which may be done in such a manner as not to injure the latter, which may be returned to the hive for future use, thus saving much time and labor for the bees in comb-making.

A foundation mill or press for making foundation comb is kept for use by some extensive apiarists, but these are somewhat expensive, and the foundation purchase of the comb itself will cost but little more than the value of the wax.



EXCELSIOR HONEY EXTRACTOR.



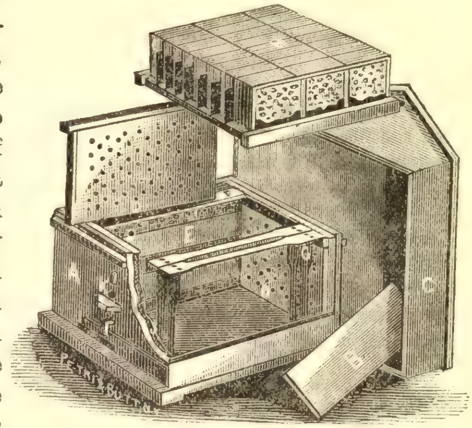
KING'S HONEY EXTRACTOR.

Hives.—The old-fashioned close box hive has long been discarded by the most successful bee-keepers, and the more commodious and improved hives have taken its place, while the match and the brimstone are becoming only a relict of discarded and barbarous practices. It is interesting to note the different kinds of hives used by certain nations. In Cyprus hives are made of mud in the shape of a cone, the inhabitants having no improved inventions. In Palestine bees are frequently kept in a water jug, the bees going in and out of the neck. In Jerusalem the traveler frequently sees hives made in the form of a conical bullet. In Lebanon and Mount Hermon they are made about three feet long and plastered with clay. In Damascus and on the desert they are made of clay (unburnt) in the form of a cylinder.

A hive is the home of the bee, and certain essentials are requisite to render it suited to the best results from the colony that inhabits it, which consist of its adaptation to the storage of honey, and the health and comfort of the colony. It should be so arranged that it may be suitably ventilated, and yet kept at a proper temperature. It must be clean, or no bee will inhabit it; it must also be properly adapted to a changeable climate, and made to be comfortable in a climate where the winters are severe, or the bees will be liable to freeze. The hives should contain movable frames, and should be closely jointed and carefully put together.

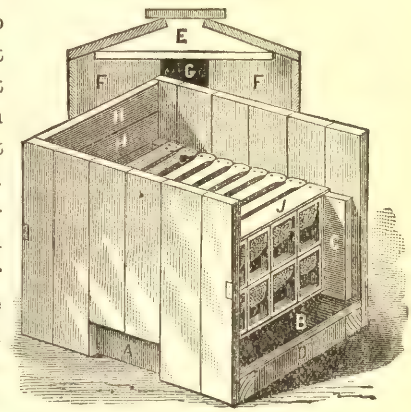
The hive should also afford every facility for constructing the combs and rearing the young broods, and admit of every part of the combs being occasionally inspected, and of their being removed when necessary. Especially should the home of the bees afford protection against moisture and the extremes of heat and cold, as well as sudden vicissitudes of temperature, since the latter will prove very injurious to the most hardy and well stocked colony.

The following cut illustrates the improved Chaff Eclectic hive. A represents the main body of the hive of which the front and back are double-walled, the inner walls J being very thin, and thickly perforated with small holes. The four inch space between the walls is occupied by two sheets of moth-proof carpet lining, leaving a space of three inches between the sheets, which, filled with chaff, serves to keep the bees warm and also absorbs and carries off the moisture generated by the swarm. D is a close-fitting division board or follower, of which there are two. These dividers are formed by covering both sides of close-fitting frames with moth-proof carpet lining overlaid with perforated veneering in the same manner as the front and rear wall of the hive. When these are in place the breeding apartment of the hive is double walled throughout, and the inner wall presents an entire surface perforated with small holes leading direct to the absorbing material, and so the hive is rendered dry and warm in the severest weather. It is manufactured by A. J. King & Co., of New York.

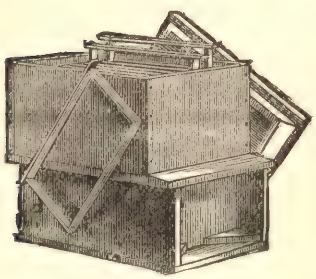


CHAFF ECLECTIC HIVE.

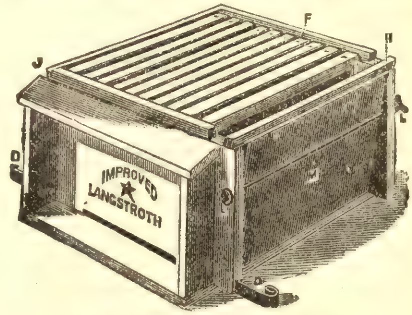
The Nellis Chaff hive, made by Houck & Peet, of Canajoharie, New York, is similar in some respects to the latter, yet differing very materially in others. It has facilities for accommodating two or more colonies at one time, if desired, and can be packed with chaff in winter to secure protection against the cold. The cut shows one end of the hive, also one follower removed. Either end can be removed in an instant when convenience requires it. Resting on the pieces C, seventeen brood frames can be put in the main hive, either for extracting honey or accommodating two colonies. Loose following boards by a simple device, are secured against the brood frames, thus making the brood chamber adjustable at any point. By means of a division board and entrance at both sides at A, two colonies can be quickly and comfortably accommodated. Broad frames of boxes can be set at the sides and all closed up by the followers. The spaces over the frames gives a large room for top storing. The bottom between A and D is double walled and can be packed with chaff or other material. The walls at C are 1⅜ inches thick, so that colonies packed at two sides, bottom and top, are well protected against cold. Or if desired, the brood frames can be turned half-way around and thus chaff can be packed on all sides.



THE NELLIS CHAFF HIVE.



LANGSTROTH HIVE.



IMPROVED LANGSTROTH HIVE.

The Langstroth hives consist of a series of movable frames for comb, so arranged that any one of them may be separately removed without disturbing the others.

Fig. 1 shows an extra story, as used on the Langstroth hives, with one of the seven cases raised, bringing to view the three boxes with the tin separator at the back, which is

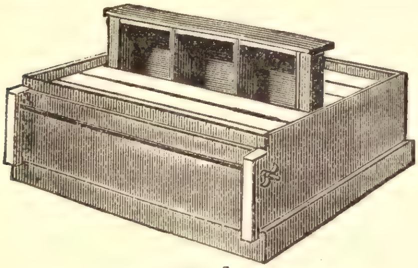


FIG. 1.

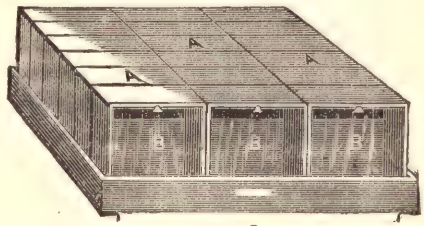
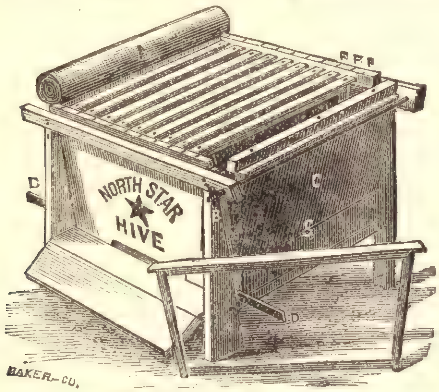
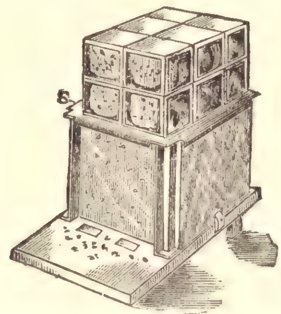


FIG. 2.

fastened to the case. Figure 2 represents the comb honey rack used in three hives, containing eighteen boxes, with the wedge to tighten or loosen the boxes as desired for manipulation. The Langstroth hives, and those represented in the following cuts, manufactured by A. H. Newman, of Chicago, Ill., have long been in use, and are quite popular among apiarists.



NORTH STAR HIVE.



WORRALL'S CENTENNIAL HIVE.

The North Star Hive is similar to the Improved Langstroth, as will be seen by the accompanying cut. Worrall's Centennial is an observatory hive with four glass sides and an iron frame. The Circular Hive, invented and manufactured by W. S. Blaisdell, of Randolph, Vt., has an adaptation of movable comb frames to the circular form of the brood chamber. Fig. 1 represents the front view of the hive, the opposite side being precisely the same. The two entrances, with the use of a suitable division board, admit of two hives being made from one. Fig. 2 represents the interior of the hive with the walls removed. Some of the exterior walls are made in sections, as may be desired, so that different parts will turn on hinges, thus permitting access to the interior arrangements without their removal.

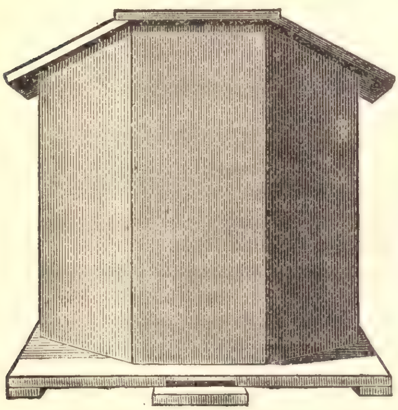


FIG. 1.

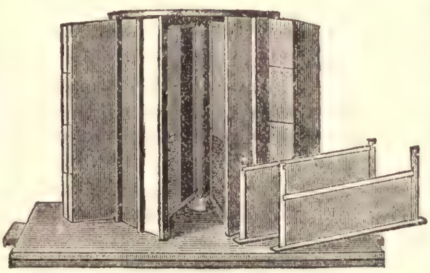


FIG. 2.

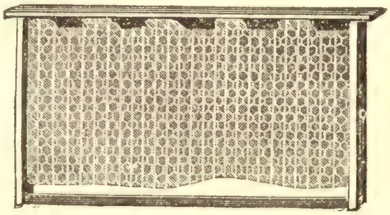
CIRCULAR HIVE.

Location of the Apiary.—With respect to the location of the apiary, a few general principles should be observed; these are briefly given by Mr. Alonzo Bradley of Massachusetts, as follows: "In selecting a place for an apiary, if there are not too many objections, locate it where the issuing of swarms can be both seen and

heard from the house, and where thieves will be shy in approaching. It is important to have it protected from the winds by a building or tight board fence. If no such place can be obtained, then posts set in the ground, with boards nailed on, will answer the purpose. The stands for the hives should be six inches or more from the ground, and have a short piece of board, making an inclined plane from the alighting board of the hive to the ground; the reason for doing this is, that during the early spring and late fall harvests of honey, the bees coming in heavily loaded on chilly days, and more especially quite late in the afternoon, in some degree relax their efforts as they near their hive. The result is, instead of alighting on the bottom board of their hive, they just fail in this, and but for the board, would pass directly under to the ground, become chilled, and unable to take wing again."

Comb Foundation. — Great advantage is derived from the use of the comb foundation, as well as that of old comb from which the honey has been extracted, since it has been estimated by repeated experiments that bees make from fifteen to twenty pounds of honey in the same time required to make one pound of comb. The comb foundation is made from beeswax rolled out in sheets about three-sixteenths of an inch thick, and passed through a double set of rollers in order to receive the exact number of indentations of cells to the square inch, and in the same form that the natural comb has. By fastening it into the honey or brood frames as a base for the bees to build up their cells upon, much labor and time is saved them in preparing, while the comb may be ready for use in a few days, that would otherwise require months to complete, time which ought to be devoted to the making of honey. The bees build these cells out to the full size required in from one to five days, and fill them with honey, or the queen deposits her eggs when necessary. When it is desired to raise drones, a larger cell is required than for the workers, and the indentations are accordingly made larger on some foundations than others for this purpose. Another advantage gained is in always having straight combs, which is not always the case when the bees make their own comb. The wired comb foundation has flat-bottomed cells, made thin and even, the wire being incorporated into it for the purpose of making it strong and to preventi ts sagging. It is used only in the brood chambers. The comb foundation may be temporarily held in place, after a little cutting and fitting, with wire, wooden pegs, or other temporary fastenings, as the bees will attach it securely to the box in a few days.

COMB FOUNDATION.



WIRED COMB FOUNDATION.

Summer Management of Bees. — The following methods of bee management have been prepared expressly for this work by an experienced apiarist, W. S. Blaisdell, of Vermont, to whom previous reference has been made: Early in the summer, two courses present themselves to the bee keeper. One of them is to run his colonies for increase in numbers; the other is to work them mainly for the production of honey. In the increase of colonies we again meet with two methods, which is either by natural or artificial swarming. As early as the limits of the hive are reached, and its whole capacity is filled with honey or brood, the bees will start queen cells preparatory to a division of the hive. The queen deposits eggs in these, as well as in other cells.

Swarming. — In ten or twelve days after the egg is laid in the royal cell, the young queen is so far matured that she utters a cry. When the young queen is killed by the old queen, her rival, swarming is delayed for awhile; but in case the bees interfere to prevent it, placing themselves as a wall around the threatened cell, the old queen collects her party, and, at the earliest favorable moment of the weather, follows them in leaving the hive. The swarm circles high in the air, and after a short time forms in a cluster in some place probably selected by the queen, the bees forming around her in solid mass. From this cluster several leaders at once issue to select a suitable place for their final destination, usually seeking a hollow tree in the forest. The cluster remains until these leaders return, be the time longer or shorter, when the entire swarm instantly rises and sweeps in a straight line to the selected spot. During this delay in the cluster, the swarm can be secured and hived; and when removed a rod or more from the place of lighting, the leaders in their return will never find them to lead them away. The best way to hive a swarm is the handiest, which may be one

of several to be entertained only in view of the situation, and which experience must teach. Such swarming of bees, being attended with so much uncertainty and sometimes loss, other methods are resorted to for increasing the stock. In some cases the queen fails to fly, and falls to the ground. She creeps back again into the hive, and the swarm is sure to follow. The bees never leave for any length of time without their queen, and if, when swarming, the queen can be captured, the bees will seek her. In order to prevent loss, it is the practice of some to clip the queen's wings on one side two-thirds of their length from the tip. This prevents her flight, and, with other management, some make it successful in securing the swarms. Care should be taken never to seize the queen by the body, for it may render her valueless, but she should always be grasped by the wings.

In eight days after swarming, another swarm will issue, since much of the brood has then hatched, unless, as is done by many, the precaution of removing all the remaining queen cells be done on the fourth or fifth day after the first swarming. The eggs are so far advanced that the bees after such time cannot construct cells therefrom for a new crop of queens. A young queen is then given them, which is readily received. Many practice this method, which usually satisfies the swarming propensity of the bees that is often difficult to control, and no inconsiderable surplus is often obtained from the old stand, as well as the new one. It depends much upon the skill of the operator, and the method he is most used to, for his best success. It should be remarked here that after the second swarm takes place no regularity is observed by others that may follow; several queen cells maturing about the same time, each queen may follow a depleted mass, and so greatly weaken the hive and prevent profitable gains. The proper time for bees to swarm is as early in the season as practicable, May being regarded as the best month, a July swarm not being considered of much value. It is a noticeable fact that first swarms generally alight near home; hence their queens can accompany them without much fatigue; and that swarms with young, unfertilized queens often settle at a greater distance from the hive; also, that second swarms are less particular to have the weather fine and sunny at the time of swarming.

Artificial Swarming. — This is the division of the hive into two or more parts, seeing that each part has late eggs from which the bees can rear queens. In doing this work, the new hive is usually put on the old stand, while the original colony is removed some distance away. Where some distance is not observed, the old bees will be apt to return to the spot, and so greatly deplete the working capacity of the older hive. The bees of the hive which does not contain the old queen will proceed to construct queen cells around some worker eggs. They will form from two to several of these cells, and in the usual length of time a new queen will issue. Her very first work will be to turn about and dispatch all the remaining queen cells, after which her flight is taken for fertilization; and so within twenty-five days after the egg was laid, she herself will be busy laying eggs. From the fact that during these twenty-five days the bees of the hive are mostly idle, with no filling up of the combs with eggs for the supply of working progeny, the practice prevails of furnishing a queen at once to the new hive, thereby gaining valuable time and a hive full of brood. By the time that otherwise the new queen would be only beginning her work among depleted workers, the queen so introduced would have brood already hatching and more coming on every day. Bee keepers are coming to understand that where they have not themselves the facility or skill to rear queens profitably, they are worth to them all that is asked, and much more, from this start of twenty-five days in the height of the summer's work.

There are many modifications of the artificial method of swarming or creating colonies, which will readily suggest themselves to the man who attempts the business. Where increase of stock is desirable, the larger number of colonies can be produced by this method, particularly when young queens are at once introduced. Where the purpose is to produce the largest amount of honey, the practice is to prevent swarming. The secret of success in honey production is to have heavy colonies for work at harvest time. One large colony will gather more product than several weak ones.

This branch of the business is acknowledged to be the most difficult, requiring the most skill and work in order to be successful. Most colonies having young queens, and with right manipulation, may be controlled; but there will be, even under favorable conditions, some exceptions. Hives will get into a swarming fever at times which no expedient can remedy. The best success, however, is had when several particulars of practice are observed. Among them may be mentioned the maintaining of young queens in the hive, or such as are not over two years of age, only in exceptional cases; to see that early and sufficient room be accessible for the deposit of surplus honey; to examine every week each colony in the most thorough

manner, and secure the removal of all queen cells; and to see that the hive has facilities for good air in very high temperatures, in fact at all times, but more especially during the days of greatest heat.

Hiving New Swarms. — To the novice in bee keeping, there is always more or less dread attended with working about bees, especially in hiving a new swarm, but to an experienced apiarist, the handling of bees for any purpose is a very simple matter. Whenever working about bees for any purpose whatever, there should be no sudden movements, no haste or excitement of any kind; if there is, the person will be liable to be stung, as the bees would become aroused and excited by such movements. Be careful not to crush a single bee, or allow one to get injured by being in any part of the clothing, as the odor would excite the whole swarm. The same is true if the person handling the bees gets stung, as bees are very susceptible to odors, and the whole colony would be thus rendered combative. There is little or no danger if the person handling them is quiet and slow in movements, and careful in each of these particulars.

When so unfortunate as to be stung, the best method of procedure is to get out of the way as quickly and in as quiet a manner as possible. Bees seem to have a natural dislike towards some persons, while they permit others to work about the hives and handle them freely, without the least appearance of displeasure. The odor of perspiration is much stronger with some people than others, and this is probably the reason of the dislike manifested by bees towards some individuals. When a person feels timid about handling bees, it may be well to secure a protection against danger by wearing a bee veil tied over the face, and tucked in around the neck and coat in such a manner as to prevent the bees from getting underneath, as shown in a previous cut. Mosquito netting, or any other thin substance that will keep the bees out, and permit a person to see through, will answer the purpose. The pants may be tied down securely over the boots, and the hands protected by a pair of long skin gauntlets tied securely over the coat cuffs. The hive should be prepared beforehand and ready for use; be sure it is clean, that is, free from all dust, dirt, or other offending substance.

When the bees settle on a low bush, as they frequently do, shake carefully as possible into the hive as many of the swarm as possible, cover and leave it near where the bees can enter. Sometimes the limb may require cutting or sawing off for this purpose; if so, do it carefully without shaking the mass of the bees more than necessary. If a large portion of the swarm falls upon the ground in attempting to get them into the hive, they may be helped to enter by carefully sweeping them towards the entrance with something soft, such as a soft brush, a bush in full leaf, etc. As soon as they begin to enter, the whole swarm will be sure to follow soon; they will therefore require no further attention until evening, when the hive should be placed where it is to remain permanently. When a swarm settles upon the limb of a tree so high that it is impossible to reach it by a ladder, it may be gently brought down by having a rope tied around it before sawing it off, the end of the rope being passed over a limb somewhat higher to ease its descent as an assistant upon the ground holds the end of the rope and regulates the velocity of its descent. During the swarming season, bees should be watched; by so doing, a swarm will seldom be lost.

Wintering Bees. — Great losses have been sustained in apiaries at the North from the mortality occasioned by severe winters. By proper care, risks can however be obviated or greatly lessened. At the present time the advocates of wintering bees on their summer stands, and those in favor of wintering in cellars, are about equal. Probably neither method will be wholly followed. Each has its advantages and disadvantages. Strong colonies with ample stores will probably come forth stronger and hardier in the spring where wintered on outside stands, properly protected in chaff hives, than if kept in the cellar. Bees in cellars consume less food, and the method may very advantageously be practiced where the colonies are weak and have light stores. More care can be shown them in the cellars. Very careful precautions, however, should be observed in preparing the cellar, and in watching its ventilation throughout the winter. The bees should be put in before the coldest weather sets in, and when the hives are perfectly dry. This last caution is *very essential.*

The cellar should be made perfectly dark, and the hives should be so arranged that the light from the lamp when going into it will not strike the entrance. It should be kept as nearly as possible at a temperature of 45°. The hives should be placed on a rack raised two feet from the cellar bottom. The honey board should be moved to uncover about one-half inch along the upper edge of the brood chamber. Rows may be piled one above the other, to rest on slats laid across the lower row of hives. Preference, however, is to be had for the

independence of each row, so that examination may be made when any particular hive requires it. A good method is to raise the honey board, and place narrow slats across the frames, and then place these on a warm quilt or cloth, which will absorb moisture and allow some ventilation. The entrance of the hives should not be closed, but left as for summer work. If rats and mice abound, cats should be employed to rid the cellar of them, but the entrances must not be closed on any account.

The ventilation of the cellar must be carefully attended to. Besides the regular means used for the purpose, as the weather moderates towards spring, the windows of the cellar should be opened after dark at evening and then closed before it is light in the morning. A good bee-house for wintering the whole stock is the best, but the cost of such would be an objection with many. The odor of a hive is the best indication of its healthfulness. Where it is at all bad, give more ventilation and resort to feeding. Bees should not be taken from their cellar quarters until the weather is somewhat settled, and there is no danger of chilling the young brood. Otherwise spring dwindling will be very apt to be the result, and this is one of the serious dangers to be apprehended and guarded against.

Bees are frequently wintered upon their summer stands, but in a cold climate they require some protection during severe winters. A simple shed for bees makes a good stand for both summer and winter, and is not expensive. It should be made with a waterproof roof, tight on the closed sides, facing the South or East, which should be open in summer, but have shutters placed in front in winter to keep out the snow. In order to have bees winter well, certain conditions are essential, which may be comprised with having the bees healthy, with plenty of young bees reared in the fall, a good supply of good honey, — at least thirty pounds in the fall for an average-sized colony in a place accessible to them, — a warm hive which will retain heat but pass off all excess of moisture and admit of ventilation, and the exclusion of snow and rain. The principal thing in summer is to avoid extreme heat, and in winter extreme cold, wet, and snow. By providing a good shed or bee-house, these may be avoided. Bees that are strong and healthy and have a good supply of honey, will endure considerable cold without freezing.

Introducing a New Queen. — It sometime happens that from the loss of the queen or mother bee, or other reasons, it is desirable to supply a swarm with a new queen. Various methods are resorted to for doing this, and even with the utmost care, a valuable queen will sometimes be lost. A method that will usually be attended with success is to let the new queen go on a comb of honey; then place a round wire-cloth thimble or cage about an inch and a half in diameter over her: press the thimble into the comb firmly; from the under side of the comb cut a hole through to the cage, leaving the cuttings in the opening thus made, and press the comb down around the entrance of the hole, so as to cause the bees considerable labor before reaching the queen. By this means the bees will generally glady welcome her. It is best never to liberate a queen, but to leave her so that the bees will have to do it themselves after a few hours. A queen should never be released from a cage of any kind while the bees evince any undue anxiety to cover the surface of the cage, or while they seem excited or nervous. The German method of introducing a queen is to remove the hive four or five feet to the front and facing the old stand, putting an empty duplicate hive in its place; then shake the bees off the combs on the ground between the two hives, and replace the frames as quickly as possible in the hives on the old stand; daub the queen with honey and drop her between the combs. Some place her at the entrance of the hive and let her go in with the other bees; others sprinkle the mass of bees on the ground quite freely with sweetened water, then place the queen daubed with honey among them and let all go in together. The objection to this method is the time consumed, and the risk attending it. If the colony has been queenless a long time, or there are no young bees of the proper age for nursing the young larvæ, a frame of hatching bees should be put in with the queen, as field bees are quite averse to working as nurses during the honey-getting season.

Stimulative Feeding.—Bees are very active in time of brood rearing while there is a supply of sweets from without. Where no artificial means are used, the bees delay active brood rearing until the flowers come. And since it takes nearly a month from the egg until the young bees are ready for work, the apiarist will be troubled with weak and dying colonies in June, with no force at the best to take advantage of the earliest honey harvest, unless he understands how to strengthen his colonies. He can easily do it by judicious feeding. For this purpose a small feeder holding about one pound of food so made as not to permit any escape of heat from the hive, should be placed on the top and filled with thin syrup. This syrup can be made of two parts of granulated sugar, and one part of water, heated and

boiled for a few minutes. A thinner syrup can be made, if the spring is cold and flights for water are sought to be obviated. Only a few pounds—say, from five to ten to a hive—need be fed, but a little thus fed in April and May, and the reward in increased strength and labor of the bees will be out of all proportion to the outlay. At the same time a little unbolted rye flour should be furnished as a substitute for pollen in a protected, sunny place for the bees, before they begin to gather pollen from the early blossoms.

The same practice of stimulating by light feeding is advised preparatory for winter. Where the hive is already full of honey, some combs should be extracted, or, if one has no apparatus for doing it, a few combs should be removed and a few empty ones put in their places. The feed at this season should be made into thick syrup, and where granulation may occur, a spoonful of vinegar will obviate it; or to be more exact, vinegar can be used in proportion to one gill to eight or ten pounds of sugar. This feeding may also be in small quantity, from three to five pounds in all, or it may be more; the bees never waste. A feeding like this during ten days in October will give a nice full hive of young bees for winter, and insure a vigorous colony in the spring. Never feed at any time, and at this time particularly, what you do not know to be absolutely *pure.* Glucose, or any proportion of it in the food will be sure to cause the death of the bees from the poison it contains.

Removing Honey from Hives.—Before commencing to work around a hive, it is best to be sure that the bees are filled with honey. At the first alarm of any kind, such as smoking them with pipe, or bee smoker, tapping on the hive, etc., the bees will at once fill themselves with honey, it seeming to be a natural instinct to prepare themselves for any emergency. After feeding about five minutes they will generally be quiet, and are then very easily managed, rarely ever stinging, unless injured, or unnecessarily disturbed. Where no bellows is had for the purpose, a little smoke from a pipe will answer the purpose quite well. Remove the honey quietly, paying no attention to the bees. If the comb sticks, loosen or cut it with a knife. Honey knives made especially for this purpose are the best. When boxes or frames are used, which are the best, simply remove the frame when the comb is filled with honey and sealed over, and supply the place with empty ones.

Honey-Bearing Plants.—It must be remembered that the bee is not a producer, but a gatherer of stores, and the vegetable world must furnish the material from which honey is to be gathered by these little industrious workers. But bees cannot gather honey where there is none to be had within easy range, nor can a colony keep itself in a proper condition to take advantage of an abundance of autumn blooming plants, when there is not an accessible supply of spring and summer blossoms to encourage brood rearing and to keep the colony strong. No farmer or stock-breeder would think of attaining success in keeping and rearing animals without providing them with food, and yet how few bee-keepers provide bee pasturage for their bees, by sowing such plants as have honey-producing blossoms. Many colonies of bees might be yearly saved from starvation, and tons of honey put upon the market, if more attention were paid towards securing a continuous pasturage for bees to work in, from early spring until late autumn. Some locations may be better adapted to certain kinds of plants than others, but there will be found a sufficient variety suited to different sections for this purpose. Where only a few colonies of bees are kept, there will generally be a sufficient supply of flowers for the bees to work upon, without any extra care in this respect, but where bee-keeping is followed as a special business, the supply of honey-bearing plants must be considered in order to make it a success. Among the clovers the Alsike, White, and Melilot or Sweet Clover are noted for their honey-producing qualities. The latter has no particular agricultural value. The plants bloom in June and July. The bass wood is also excellent for bee pasturage, while the apple, and other fruit trees, the locust, the raspberry, and blackberry, are exceedingly valuable.

The nectar of the common red clover is located beyond the reach of our honey bees, and it is the prevalent opinion among apiarists that could we obtain an improved breed of bees that had tongues sufficiently long to utilize the blossoms of this plant, our honey production would be largely increased. The dandelion and strawberry are among the earliest blooming plants, at a time when the honey forage is scarce, and consequently a trying one for bees. During May and June the Sumac and White Sage are very abundant in some sections, especially in California, while at the South, which is one of the very best regions for bee culture, owing to its climate and wealth of flowers, the cotton plant furnishes an abundant source of honey supply from June until the frost comes. In the autumn the Wild Aster, Golden Rod, and Buckwheat are a prolific source of honey, but the products made from these blossoms have a deep color, and a peculiar flavor which discounts them in the market. Surplus boxes are

usually removed early in August so that the white quality gathered may not be tainted with these later products. The number of honey-bearing wild flowers is very large, while many of the forest trees, such as the varieties of Maples, Aspens, Linden, Willow, etc., are valuable for this purpose. The practice is prevailing in some sections for bee-keepers to cultivate such plants as are known to yield honey. Alsike Clover, Sweet Clover, White Clover, and Giant Mignonette are among the best, together with others not so prominent. A few acres of these will pay large returns in keeping up a fine bloom, producing the choicest quality of nectar until frost comes.

Pliny states that the practice of removing bees from place to place, in order to keep them supplied with good pasturage, was common in the Roman territory; he says: "As soon as the spring food for bees has failed in the villages near our towns, the hives of bees are put into boats and carried up against the stream of the river in the night, in search of pasture. The bees go out in the morning in quest of provisions, and return regularly to their hives in the boats, with the stores they have collected. This method is continued till the sinking of the boats to a certain depth in the water shows that the hives are sufficiently full; and they are then carried back to their former homes, where their honey is taken out of them." This custom is still in practice in Italy, France, and Egypt, floating barges of bees being frequently seen in the river Po, the Nile, and many of the rivers in France. This practice has been tested to a certain extent on the lower Mississippi, with good results, and when properly conducted would doubtless prove a very remunerative enterprise.

Enemies and Diseases of Bees.—Bees have many enemies, among which may be mentioned the wasp, hornet, the bee-killer (*Asilus*), a two-winged fly which seizes the bee and sucks its fluid, spiders which sometimes entangle them in their nests, ants which sometimes prove troublesome in the hive, the king-bird, woodpecker, swallow, sparrow, rats, mice, lizards, toads, etc. But the worst enemy to bees is the moth, two species of which (*Galleria mellonella* and *Achroia grisella*) find their way into the hive, where they deposit their eggs on the comb in such vast numbers that the hive is soon filled with the larvæ, which spin their webs and destroy the comb to such an extent that the bees are forced to leave the hive. The female moth is considerably larger than the male, and is in color a silver gray. As long as a colony of bees is strong and in good condition, it is safe from these worms, but if weakened by overswarming, loss of queen, or in any other way, the moth is pretty sure to make depredations on the hive, and fill it with larvæ. There can really be no perfectly moth proof hive, as the moth finds entrance where the bees do, and in order to be perfectly moth proof, a hive must exclude the bees also. A trap for the moths can be made of a mixture of vinegar and water well sweetened and placed towards evening in white dishes among the hives, in which many of the moths will be drowned. Worms may also be caught early in the season, by laying pieces of shingles down upon the bottom board. The worms will retreat under these for a sheltered place to spin their cocoons, and must be destroyed once or twice a week. The moth is less troublesome in large apiaries than small, as the former have better care and management, and the colonies are kept in a more vigorous and thrifty condition.

BEE MOTH.

A good authority on this subject, Mr. Hutchin, of Farlinville, Kansas, recommends the following method: "The sprightly little wren, if encouraged to build its nest near the hives, will destroy myriads of worms and insects. They are easily attracted, by putting up boxes made three inches square, with an inch and a half hole for an entrance."

The following method will frequently prove effectual in destroying the moth: Set a pan of grease or oil in a tub of water; light it and set it in the apiary, and keep it burning all night. The light attracts the miller, which flits around it and either perishes in the flame or is drowned in the water. Various other means may be employed for the destruction of the bee moth, and moth traps of various styles have been invented, but they are apt to be neglected, and, unless properly attended to, and emptied once or twice a week, they become moth nurseries instead of traps, and aid in breeding this pest.

Bees are subject to but few diseases, but these are sometimes very fatal. The dysentery occasionally makes great havoc in a hive, and is generally caused by neglect of sanitary conditions, by close confinement, dampness, lack of ventilation, by their being forced into undue excitement in cold weather, improper food, etc. This disease is indicated by the appearance of the excrement within the hive, which the bees, when in a healthy state, are particularly

careful to entirely exclude. The disease known as "foul brood" is the most fatal of all to bees, and is very contagious, the infection frequently remaining in the hives, comb, and honey for a long time after the bees are exterminated. Dysentery is a disease confined to the perfectly grown insects, but foul brood is confined to the larvæ, which, when grown near to maturity, die and putrefy after being sealed over by the bees. The brood become brown, and give off an offensive odor that can easily be detected in any hive, while the working bees seem wholly unable to remove this foul mass that remains to spread contagion to other broods and other hives. This disease is supposed to be caused by the presence of spores of a microscopical fungus (*micrococcus*), and when it once gets into an apiary, is very apt to carry destruction with it, since the young brood, dying off at such a rate, will soon cause a general decline in the colonies. The spores get into the honey, and the bees, eating it and feeding it to the larvæ, infect them generally. The following remedy is said to be successful in eradicating this disease: eight grains salicylic acid, eight grains soda borax, one ounce of soft water; mix thoroughly, uncap all the brood, and throw a solution over the comb with a spraying machine.

Keeping and Making Honey.—Some cap honey will not crystalize under any conditions, while again, honey that seems to be of equally good quality will crystalize in a short time. The best means of preventing crystalization is to keep it in a dark, dry and warm room, especially the latter. A honey room for storing honey should be had in connection with every large apiary. Mr. G. M. Doolittle of Borodino, N. Y., an extensive apiarist of many years experience, gives the following directions respecting the storing of honey and preparing for market:

"If possible, we want our honey room in the warmest part of the building occupied, so as to evaporate the honey that is in the few unsealed cells around the edges of the boxes next to the wood, in order that when we come to glass it, or get it ready for market, the honey will not run out and soil the combs or boxes. To this end we painted our shop a dark color, and located our honey room in the southwest corner, so that the rays of the afternoon sun would make it very warm. When we get a ton or so of honey in it, the temperature stands at nearly 90° day and night, as the honey holds the heat generated during the day, through the night. By leaving it thus for a month, we have our honey so we can tip it over just as we wish without leakage, and if after it gets to market it happens to be kept in a damp, cool room, it will be some time before it will take on moisture enough to affect the looks of the comb to any extent.

We are often asked the cause of honey oozing out of the cells. The cause is *dampness.* While in a large market in New York, not long since, we saw honey that had been kept in a damp, underground room so long that the sealing of the cells had burst, the honey had soured, and was leaking from the comb badly, while the odor from it was offensive. While speaking to the parties about it, they said they believed a cellar the best place to keep honey, but it needed little argument to convince them that they were wrong. Of course this high temperature will cause the moths to hatch soon, but they may be easily disposed of. In preparing the honey for market, which we commence to do by the middle of August, it must be glassed and crated. Have your crate by your side and the glass near you. First get the propolis out of the corners of the box, if there is any where the glass is to come; then bend up the little tins put in to hold the glass, drop in your glass, and bend down the tins. Now you can scratch off the propolis on the edges of the box without getting it on the honey. Scrape off clean so the box will look nice and tidy, and set in the crate.

In crating honey it is always proper to put the best side of the honey out, the same as wool is done up. We once knew a man to do up his wool with the dark or outside ends out, and he could hardly sell it at any price. Why? Not because the wool was not just as good, but because it did not look so well. Just so with a crate of honey. Market men want the best side out, but do not mistake and fill up the center of the crate with dark honey. Grade your honey and then put the best side of each lot out, but let your white honey be all No. 1 white.

When the crate is full put on the cover with bright, round-headed screws. This gives the crate a nice appearance, does not tend to break the honey like driving nails, and the cost is but a trifle. When crated, sand-paper off the sharp corners and top of the crate, and pack nicely away till ready to ship to market.

We have had much trouble in getting glass cut accurate enough to suit us, as they do not expect to cut very close at the factories, and if a glass is a little large it springs the box from the honey and sets it to leaking. For the past few years we have bought our glass cut

6 by 30 inches, and re-cut it the 5-inch way ourselves. We cut the same as in a mitre-box—that is, have a box fixed with regulating screws, so that you can cut the glass just exactly five inches every time. Have your cutting stick fastened to the box so the glass will go under it; shove up the screws and cut; leave a drop of two inches under, and touch the glass so as to break off where cut and drop down; shove up and cut again, breaking off as before. Thus you can cut very fast and be sure every glass is right.

Sell your honey, if possible, rather than ship on commission, for the returns rendered by the commission men are not always satisfactory. Always ship your honey in warm weather (the first half of September) if possible, as it will go much more safely than in cold weather. If you can sell your honey at home, do so, but the most of us cannot so dispose of a large quantity. If we prefer to have our buckwheat and fall honey stored in boxes, we leave them on the hive; otherwise it is best to take them off, for the bees daub them badly with propolis at this season of the year. A good way is to take off the boxes and put in frames in place of the side boxes, having them filled to store away for feeding purposes. Bees will build comb very fast in the body of the hive during a good buckwheat yield."

Profits of Bee Keeping.—Under proper management, bee-keeping is a very profitable business, as will be seen from the following testimony from some of the most successful apiarists of the country. Mr. G. M. Doolittle, the authority previously quoted, says:

"Commencing a certain season with sixty hives, I had a hundred colonies to go into winter quarters, having obtained in box honey 2,909 pounds, and 572 pounds of extracted, making 3,481 pounds in all, or 58 pounds per stock as an average yield. This is the lightest yield I have had during seven years, with the exception of one year when the average yield per colony was only 50 pounds. For the past seven years (and it is only by a number of years' experience in any business that a true result as regards the profit or loss can be obtained) the report of our apiary stands as follows: At the end of the first of the seven years' report, the average yield in honey was eighty pounds per colony; the second year, a fraction of a pound less than 100 pounds: the third, a little over 106 pounds; the fourth, 50 pounds; the fifth, a little less than 167 pounds; the sixth, just 71 pounds, and the seventh, 58 pounds, making an average yield for the past seven years of a little over 90 pounds per stock. Upon looking over my diary I ascertain that this honey has been sold at an average price of 21¼ cents per pound, the highest price being 28½ cents, and the lowest 10¾ cents. From past experience, I believe a thorough, practical man can do all the work required to be done with 100 colonies of bees, and judging from the above, he would obtain for an average term of years 9,000 pounds of honey annually, which, at 21¼ cents per pound, would bring him in a yearly income of $1,912.50."

Mr. D. A. Jones, the owner of one of the most extensive apiaries in the country, if not in the world, has his bee farm located near Beeton, Ontario, Canada, his four bee yards being situated at the angles of a square which embraces several square miles of country. During the current year Mr. Jones has already taken, at the last of July, 50,000 pounds of honey from 620 colonies of bees, and, judging from yields of previous years, calculated the total yield for the year to be 70,000 pounds, in which case the total net profit would be between $7,000 and $10,000.

Mr. W. L. Hutchinson, of Michigan, says: "There is no question in my mind that, if properly managed, there is money in bees, as during the four years that I have been engaged in the business I have never made less than $15 per swarm, clear profit, each season; this season realizing $25 per colony." Mr. J. G. Taylor of Austin, Texas, reports thus: "I commenced in the spring with seven colonies; up to June 20th I took 968 pounds of surplus honey, and increased to twenty good colonies."

Mr. J. F. Meyer of Wyandotte, Kansas, makes the following statement: "My market is at home, retailing at from 15c. to 17½c. per pound. My honey crop this year is 2,200 pounds from thirty full colonies. I sold in the spring twenty-five colonies."

We thus see that it is no uncommon occurrence for a colony of bees to produce seventy pounds of honey or more during a single season, when under proper management. In fact, a good strong colony of bees located in a region of country producing an average quantity of honey-producing flowers, will, with careful management, produce 100 pounds of surplus comb honey, and still allow another strong colony to be made from it. The extra colony will amply pay all expenses for the labor performed. This, with a fair price for honey, will net $20 to each colony. Much better results than this are frequently realized by our most successful bee keepers. An active man, who understands the business, should be able to attend to from one hundred to two hundred colonies.

PART VII.

VARIOUS TOPICS.

SILK CULTURE.

THE precise period when silk was first used as a textile material is not known, but its history is one of great antiquity. It seems to have come into use after wool and linen, and is one of the early industries mentioned in history. Writers differ very materially in regard to the date of its origin, some placing it at 2700 and others 1700 B. C. The Chinese records state that the wife of Hoang-Ti, the third emperor of China, first tested the practicability of using the thread from the cocoons, and discovered the method of reeling the silk and of employing it to make garments. Silk is one of the most valuable of fabrics, and the producing of it has attracted much attention in all civilized countries where it may be produced. The importance of this industry, and the increased interest at present manifested in it in this country, together with the growing demand for the raw material, augurs favorably for its becoming more extended and permanently established here at a time not far distant, it now being in its infancy. The following on the habits of the silk worm, together with practical instructions relating to their rearing and general management, is extracted from the manual of Prof. C. V. Riley, one of the best authorities on this subject in this country, if not in the world:

Characteristics and Different States or Stages of the Silk-Worm.—The silk-worm, or that which supplies the ordinary silk of commerce, is the larva of a small moth known to scientific men as *Sericaria mori.* It is often popularly characterized as the Mulberry Silk-Worm. Its place among insects is with the *Lepidoptera*, or scaly-winged insects, family *Bombycidæ*, or spinners. There are several closely allied species, which spin silk of different qualities, none of which, however, unites strength and fineness in the same admirable proportions as does that of the mulberry species. The latter has, moreover, acquired many useful peculiarities during the long centuries of cultivation it has undergone. It has in fact become a true domesticated animal. The quality which man has endeavored to select in breeding this insect is, of course, silk-producing, and hence we find that, when we compare it with its wild relations, the cocoon is vastly disproportionate to the size of the worm which makes it or the moth that issues from it. Other peculiarities have incidentally appeared, and the great number of varieties or races of the silk-worm almost equals those of the domestic dog. The white color of the species, its seeming want of all desire to escape as long as it is kept supplied with leaves, and the loss of the power of flight on the part of the moth, are all undoubtedly the result of domestication. From these facts, and particularly from that of the great variation within specific limits to which the insect is subject, it will be evident to all that the following remarks upon the nature of the silk-worm must necessarily be very general in their character. The silk-worm exists in four states—egg, larva, chrysalis, and adult or imago—which we will briefly describe.

The Egg.—The egg of the silk-worm moth is called by silk raisers the "seed." It is nearly round, slightly flattened, and in size resembles a turnip seed. Its color when first deposited is yellow, and this color it retains if unimpregnated. If impregnated, however, it soon acquires a gray, slate, lilac, violet, or even dark green hue, according to variety or breed. It also becomes indented. When diseased, it assumes a still darker and dull tint. With some varieties it is fastened to the substance upon which it is deposited by a gummy secretion of the moth produced in the act of ovipositing. Other varieties, however, among which may be mentioned the Adrianople whites and the yellows from Nouka, in the Caucassus,

EAST INDIA SILK WORM.

have not this natural gum. As the hatching point approaches, the egg becomes lighter in color, which is due to the fact that its fluid contents become concentrated, as it were, into the central, forming worm, leaving an intervening space between it and the shell, which is semi-transparent. Just before hatching, the worm within becoming more active, a slight clicking sound is frequently heard, which is, however, common to the eggs of many other insects. After the worm has made its exit by gnawing a hole through one side of the shell, this last becomes quite white. Each female produces on an average from three to four hundred eggs, and one ounce of eggs contains about 40,000 individuals. It has been noticed that the color of the albuminous fluid of the egg corresponds to that of the cocoon, so that when the fluid is white the cocoon produced is also white, and when yellow the cocoon again corresponds.

The Larva or Worm.—The worm goes through from three to four moults or sicknesses, the latter being the normal number. The periods between these different moults are called "ages," there being five of these ages, including the first from the hatching and the last from the fourth moult to the spinning period. The time between each of these moults is usually divided as follows: The first period occupies from five to six days, the second but four or five days, the third about five, the fourth from five to six, and the fifth from eight to ten. These periods are not exact, but simply proportionate. The time from the hatching to the spinning of the cocoons may, and does vary all the way from thirty to forty days, depending upon the race of the worm, the quality of the food, mode of feeding, temperature, etc.; but the same relative proportion of time between moults usually holds true.

The color of the newly-hatched worm is black or dark gray, and it is covered with long, stiff hairs, which, upon close examination, will be found to spring from pale-colored tubercles. Different shades of dark gray will, however, be found among worms hatching from the same batch of eggs. The hairs and tubercles are not noticeable after the first moult, and the worm gradually gets lighter and lighter until, in the last age, it is of a cream-white color. When full grown, it presents the appearance as indicated in the cut. It never becomes entirely smooth, however, as there are short hairs along the sides, and very minute ones, not noticable with the unaided eye, all over the body.

The preparation for each moult requires from two to three days of fasting and rest, during which time the worm attaches itself firmly by the abdominal prolegs (the 8 non-articulated legs under the 6th, 7th, 8th, and 9th segments of the body, called prolegs in contradistinction to the 6 articulated true legs under the 1st, 2d, and 3d segments), and holds up the fore part of the body, and sometimes the tail. In the operation of moulting, the new head is first disengaged from the old skin, which is then gradually worked back from segment to segment until entirely cast off. If the worm is feeble, or has met with any misfortune, the shriveled skin may remain on the end of the body, being held by the anal horn; in which case the individual usually perishes in the course of time. It has been usually estimated that the worm in its growth consumes its own weight of leaves every day it feeds; but this is only an approximation. Yet it is certain that during the last few days before commencing to spin, it consumes more than during the whole of its previous worm existence. It is a curious fact, first noticed by Quatrefages, that the color of the abdominal prolegs at this time corresponds with the color of the silk.

Having attained full growth, the worm is ready to spin up. It shrinks somewhat in size, voids most of the excrement remaining in the alimentary canal; acquires a clear, translucent, often pinkish or amber-colored hue; becomes restless; ceases to feed, and throws out silken threads. The silk is elaborated in a fluid condition in two long, slender, convoluted vessels, one upon each side of the alimentary canal. As these vessels approach the head, they become less convoluted and more slender, and finally unite within the spinneret, from which the silk issues in a glutinous state and apparently in a single thread. The glutinous liquid which combines the two, and which hardens immediately on exposure to the air, may, however, be dissolved in warm water. The worm usually consumes from three to five days in the construction of the cocoon, and then passes, in three days more, by a final moult, into the chrysalis state.

The Cocoon.—The cocoon consists of an outer lining of loose silk, known as "floss," which is used for carding, and is spun by the worm in first getting its bearings. The amount of this loose silk varies in different breeds. The inner cocoon is tough, strong, and compact, composed of a firm, continuous thread, which is, however, not wound in concentric circles as might be supposed, but irregularly, in short figure of eight loops, first in one place and then in another, so that in reeling several yards of silk may be taken off without the cocoon turn-

ing round. In form the cocoon is usually oval, and in color yellowish; but in both these features it varies greatly, being either pure silvery-white, cream or carneous, green, and even roseate, and very often constricted in the middle. It has always been considered possible to distinguish the sex of the contained insect from the general shape of the cocoon, those containing males being slender, depressed in the middle, and pointed at both ends, while the female cocoons are of a larger size and rounder form, and resemble in shape a hen's egg with equal ends.

The Chrysalis. — The chrysalis is a brown, oval body, considerably less in size than the full-grown worm. In the external integument may be traced folds corresponding with the abdominal rings, the wings folded over the breast, the antennæ, and the eyes of the inclosed insect — the future moth. At the posterior end of the chrysalis, pushed closely up to the wall of the cocoon, is the last larval skin, compressed into a dry wad of wrinkled integument. The chrysalis state continues for from two to three weeks, when the skin bursts and the moth emerges.

The Moth. — With no jaws, and confined within the narrow space of the cocoon, the moth finds some difficulty in escaping. For this purpose it is provided, in two glands near the obsolete mouth, with a strongly alkaline liquid secretion, with which it moistens the end of the cocoon and dissolves the hard, gummy lining. Then, by a forward and backward motion, the prisoner, with crimped and damp wings, gradually forces its way out, and when once out the wings soon expand and dry. The silken threads are simply pushed aside, but enough of them get broken in the process to render the cocoons from which the moths escape comparatively useless for reeling. The moth is of a cream color, with more or less distinct brownish markings across the wings. The males have broader antennæ or feelers than the females, and may by this feature at once be distinguished. Neither sex flies, but the male is more active than the female. They couple soon after issuing, and in a short time the female begins depositing her eggs, whether they have been impregnated or not. Very rarely the unimpregnated egg has been observed to develop.

Varieties or Races. — Domestication has had the effect of producing numerous varieties of the silk-worm, every different climate into which it has been carried having produced some changes in the quality of the silk, or the shape or color of the cocoons, or else altered the habits of the worm.

Some varieties produce but one brood in a year, no matter how the eggs are manipulated; such are known as *Annuals.* Others, known as *Bivoltins*, hatch twice in the course of the year; the first time, as with the Annuals, in April or May, and the second eight or ten days after the eggs are laid by the first brood. The eggs of the second brood only are kept for the next year's crop, as those of the first brood always either hatch or die soon after being laid. The *Trevoltins* produce three annual generations. There are also *Quadrivoltins*, and, in Bengal, a variety known as *Dacey*, which is said to produce eight generations in the course of a year. Some varieties moult but three times instead of four, especially in warm countries and with Trevoltins. Experiments, taking into consideration the size of the cocoon, quality of silk, time occupied, hardiness, quantity of leaves required, etc., have proved the annuals to be more profitable than any of the polyvoltins, although Bivoltins are often reared; and Mr. Alfred Brewster, of San Gabriel, Cal., says that he found a green Japanese variety of these last more hardy than the Chinese Annuals. Varieties are also known by the color of the cocoons they produce, as greens, or whites, or yellows, and also by the country in which they flourish. The white silk is the most valuable in commerce, but the races producing yellow, cream-colored, or flesh-colored cocoons are generally considered to be the most vigorous. No classification of varieties can be attempted, as individuals of the same breed exported to a dozen different localities would, in all probability, soon present a dozen varieties. The three most marked and noted European varieties are the Milanese (Italian) breed, producing small yellow cocoons; the Ardêche (French), producing large yellow cocoons; and the Brousse (Turkish), producing large white cocoons of the best quality in Europe. Owing to the fearful prevalence of *pébrine* among the French and Italian races for fifteen or twenty years back, the Japanese Annuals have come into favor. The eggs are bought at Yokohama in September, and shipped during the winter. There are two principal varieties in use, the one producing white and the other greenish cocoons, and known respectively as the white Japanese and the green Japanese Annuals. These cocoons are by no means large, but the pods are solid and firm, and yield an abundance of silk. They are about of a size, and both varieties are almost always constricted in the middle. Another valuable race is the white

Chinese Annual, which much resembles the white Japanese, but is not as generally constricted.

Wintering and Hatching the Eggs. — We have already seen the importance of getting healthy eggs, free from hereditary disease, and of good and valuable races. There is little danger of premature hatching until December, but from that time on the eggs should be kept in a cool, dry room in tin boxes to prevent the ravages of rats and mice. They are most safely stored in a dry cellar, where the temperature rarely sinks below the freezing point, and they should be occasionally looked at to make sure that they are not affected by mold. If, at any time, mold be perceived upon them, it should be at once rubbed or brushed off, and the atmosphere made drier. If the tin boxes be perforated on two sides, and the perforations covered with fine wire gauze, the chances of injury will be reduced to a minimum.

The eggs may also, whether on cards or loose,* be tied up in small bags and hung to the ceiling of the cold room. The string of the bag should be passed through a bottle neck or a piece of tin to prevent injury from rats and mice. The temperature should never be allowed to rise above 40° F., but may be allowed to sink below freezing point without injury. Indeed, eggs sent from one country to another are usually packed in ice. They should be kept at a low temperature until the mulberry leaves are well started in the spring, and great care must be taken as the weather grows warmer to prevent hatching before their food is ready for them, since both the mulberry and osage orange are rather late in leaving out. One great object should be, in fact, to have them all kept back, as the tendency in our climate is to premature hatching. Another object should be to have them hatch uniformly, and this is best attained by keeping together those laid at one and the same time, and by wintering them, as already recommended, in cellars that are cool enough to prevent any embryonic development. They should then, as soon as the leaves of their food-plant have commenced to put forth, be placed in trays and brought into a well-aired room, where the temperature averages about 75° F. If they have been wintered adhering to the cloth on which they were laid, all that is necessary to do is to spread this same cloth over the bottom of a tray. If, on the contrary, they have been wintered in the loose condition, they must be uniformly sifted or spread over sheets of cloth or paper. The temperature should be kept uniform, and a small stove in the hatching room will prove very valuable in providing this uniformity. The heat of the room may be increased about 20° each day, and if the eggs have been well kept back during the winter they will begin to hatch under such treatment on the fifth or sixth day. By no means must the eggs be exposed to the sun's rays, which would kill them in a very short time. As the time of hatching approaches, the eggs grow lighter in color, and then the atmosphere must be kept moist artificially by sprinkling the floor, or otherwise, in order to enable the worms to eat through the egg shell more easily. They also appear fresher and more vigorous with due amount of moisture.

Feeding and Rearing the Worms. — The room in which the rearing is to be done should be so arranged that it can be thoroughly and easily ventilated, and warmed if desirable. A northeast exposure is the best, and buildings erected for the express purpose should, of course, combine these requisites. If but few worms are to be reared, all the operations can be performed in trays upon tables, but in large establishments the room is arranged with deep and numerous shelves, from 4 to 8 feet deep and 2 feet 6 inches apart. All wood, however, should be well seasoned, as green wood seems to be injurious to the health of the worms. When the eggs are about to hatch, mosquito netting or perforated paper should be laid over them lightly. Upon this can be evenly spread freshly-plucked leaves or buds. The worms will rise through the meshes of the net or the holes in the paper and cluster upon the leaves, when the whole net can easily be moved. In this moving, paper has the advantage over the netting, in that it is stiffer and does not lump the worms together in the middle. They may now be spread upon the shelves or trays, care being taken to give them plenty of space, as they grow rapidly. Each day's hatching should be kept separate, in order that the worms may be of a uniform size, and go through their different moultings or sicknesses with regularity and uniformity; and all eggs not hatched after the fourth day from the appearance of the first should be thrown away, as they will be found to contain inferior, weakly, or sickly worms. It is calculated that one ounce of eggs of a good race will produce 100 pounds of fresh cocoons; while for every additional ounce the percentage is reduced if the worms are all raised together, until for 20 ounces the average does not exceed 25 pounds of cocoons per ounce.

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*For explanation, see what follows under egg-laying.

The young worms may be removed from place to place by means of a small camel's hair brush, but should be handled as little as possible. The best mode of feeding and caring for them is by continuing the use of the feeding net first mentioned. As the worms increase in size the net must have larger meshes, and, if it should be used every time fresh food is furnished, it will save a large amount of time and care. It entirely obviates the necessity of handling the worms, and enables the person having charge of them to keep them thoroughly clean; for, while they pass up through the net to take their fresh food, their excrement drops through it and is always taken up with the old litter beneath. It also acts as a detective of disease; for such worms as are injured, feeble, or sickly usually fail to mount through the meshes, and should be carried off and destroyed with the refuse in the old net below. This placing on of the new net and carrying away of the old is such a great convenience and time-saver that in France, for many years, paper stamped by machinery with holes of different sizes, suited to the different stages of the worms, has been used. The paper has the advantage of cheapness and stiffness, but a discussion as to the best material is unnecessary here, the aim being to enforce the principle of the progressive rise of the worms. Details will suggest themselves to the operator.

Where the nets are not used, there is an advantage in feeding the worms upon leaf-covered twigs and branches, because these last allow a free passage of air, and the leaves keep fresh a longer time than when plucked. In this feeding with branches consists the whole secret of the California system, so much praised and advocated by M. L. Prevost. The proper stamped paper not being easily obtained in this country, mosquito netting will be found a very fair substitute while the worms are young, and when they are larger I have found thin slats of some non-resinous and well-seasoned wood, tacked in parallel lines to a frame just large enough to set in the trays, very serviceable and convenient; small square blocks of similar wood being used at the corners of the tray to support the frame while the worms are passing up through it. Coarse twine netting stretched over a similar frame will answer the same purpose, but wire netting is less useful, as the worms dislike the smooth metal.

Many rules have been laid down as to regularity of feeding, and much stress has been put upon it by some writers, most advising four meals a day at regular intervals, while a given number of meals between moults has also been urged; but such definite rules are of but little avail, as so much depends upon circumstances and conditions. The food should, in fact, be renewed whenever the leaves have been devoured, or whenever they have become in the least dry, which, of course, takes place much quicker when young and tender than when mature. This also is an objection to the use of the hashed leaves, as, of course, they would dry very quickly. The worms eat most freely early in the morning and late at night, and it would be well to renew the leaves abundantly between five and six A. M., and between ten and eleven P. M. One or two additional meals should be given during the day, according as the worms may seem to need them. Great care should be taken to pick the leaves for the early morning meal the evening before, as when picked and fed with the dew upon them they are more apt to induce disease. Indeed, the rule should be laid down, never feed wet or damp leaves to your worms. In case they are picked during a rain, they should be thoroughly dried before being fed; and on the approach of a storm it is always well to lay in a stock, which should be kept from heating by occasional stirring. Care should also be taken to spread the leaves evenly, so that all may feed alike. During this first and most delicate age the worm requires much care and watching.

As the fifth or sixth day approaches, signs of the first moult begin to be noticed. The worm begins to lose appetite and grow more shiny, and soon the dark spot already described appears above the head. Feeding should now cease, and the shelves or trays should be made as clean as possible. Some will undoubtedly undergo the shedding of the skin much more easily and quickly than others, but no feed should be given to these forward individuals until nearly all have completed the moult. This serves to keep the batch together, and the first ones will wait one or even two days without injury from want of food. It is, however, unnecessary to wait for all, as there will always be some few which remain sick after the great majority have cast their skins. These should either be set aside and kept separate, or destroyed, as they are usually the most feeble and most inclined to disease; otherwise, the batch will grow more and more irregular in their moultings and the diseased worms will contaminate the healthy ones. It is really doubtful whether the silk raised from these weak individuals will pay for the trouble of rearing them separately, and it will be better perhaps to destroy them. The importance of keeping each batch together, and of causing the worms to moult simultaneously, cannot be too much insisted upon as a means of saving time.

As soon as the great majority have moulted they should be copiously fed, and, as they grow very rapidly after each moult, and as they must always be allowed plenty of room, it will probably become necessary to divide the batch, and this is readily done at any meal by removing the net when about half the worms have risen and replacing it by an additional one. The space allotted to each batch should, of course, be increased proportionately with the growth of the worms. The same precautions should be observed in the three succeeding moults as in this first one.

As regards the temperature of the rearing-room, great care should be taken to avoid all sudden changes from warm to cold, or *vice versa.* A mean temperature of 75° or 80° F. will usually bring the worms to the spinning-point in the course of thirty-five days after hatching, but the rapidity of development depends upon a variety of other causes, such as quality of leaf, race of worm, etc. If it can be prevented, the temperature should not be permitted to rise very much above 80°, and it is for this reason that a room with a northern or northeastern exposure was recommended as preferable to any other. The air should be kept pure all of the time, and arrangements should be made to secure a good circulation. Great care should be taken to guard against the incursions of ants and other predaceous insects, which would make sad havoc among the worms were they allowed an entrance; and all through the existence of the insect, from the egg to the moth, rats and mice are on the watch for a chance to get at them, and are to be feared almost as much as any other enemy the silk-worm has.

The second and third casting of the skin takes place with but little more difficulty than the first, but the fourth is more laborious, and the worms not only take more time in undergoing it, but more often perish in the act. At this moult it is perhaps better to give the more forward individuals a light feed as soon as they have completed the change, inasmuch as it is the last moult and but little is to be gained by the retardation, whereas it is important to feed them all that they will eat, since much of the nutriment given during the last age goes for the elaboration of the silk. At each successive moult the color of the worm has been gradually whitening, until it is now of a decided cream color. Some breeds, however, remain dark, and occasionally there is an individual with zebra-like markings. During these last few days the worms require the greatest care and attention. All excrement and litter must be often removed, and the sickly and diseased ones watched for and removed from the rest. The quantity of leaves which they devour in this fifth age is something enormous, and the feeding will keep the attendant busily employed.

Summed up, the requisites to successful silk-worm raising are: 1. Uniformity of age in the individuals of the same tray, so as to insure their moulting simultaneously. 2. No intermission in the supply of fresh food, except during the moulting periods. 3. Plenty of room so that the worms may not too closely crowd each other. 4. Fresh air and as uniform temperature as possible. 5. Cleanliness. The last three are particularly necessary during the fourth and fifth ages. While small, the frass, dung, and detritus dry rapidly, and may (though they should not) be left for several days in a tray with impunity, but he who allows his trays to go uncleaned for more than a day during the ages mentioned will suffer in the disease and mortality of his worms just as they are reaching the spinning-point.

Preparation for Spinning.—With eight or ten days of busy feeding, after the last moult, the worms, as we have learned before, will begin to lose appetite, shrink in size, become restless, and throw out silk, and the arches for the spinning of the cocoons must now be prepared. These can be made of twigs of different trees, two or three feet long, set up upon the shelves over the worms, and made to interlock in the form of an arch above them. Interlace these twigs with broom corn, hemlock, or other well-dried brush. The feet of each arch should be only about a foot apart. The temperature of the room should now be kept above 80°, as the silk does not flow so freely in a cool atmosphere. The worms will immediately mount into the branches and commence to spin their cocoons. They will not all, however, at the same time, and those which are more tardy should be fed often, but in small quantities at a time, in order to economize the leaves, as almost every moment some few will quit and mount. There will always be a few which altogether fail to mount, and prefer to spin in their trays. It is best, therefore, after the bulk have mounted, to remove the trays and lay brush carefully over them. The fact that the worms already mounted make a final discharge of soft and semi-fluid excrement before beginning to spin makes this separation necessary, as otherwise the cocoons of the lower ones would be badly soiled. As the worms begin to spin they should be carefully watched, to guard against two or three of them making what is called a double or treble cocoon, which would be unfit for reeling purposes. Whenever one worm is about to spin up too near another, it should be carefully removed to another part of the

arch. In two or three days the spinning will have been completed, and in six or seven the chrysalis will be formed.

Gathering the Cocoons. — Eight days from the time the spinning commenced it will be time to gather the cocoons. The arches should be carefully taken apart, and the spotted or stained cocoons first removed and laid aside. Care should be taken not to stain the clean ones with the black fluids of such worms as may have died and become putrid, for there are always a few of these in every cocoonery. The outer cocoons of loose or floss silk are then torn from the inner cocoons or pods, and the latter separated according to color, weight, and firmness of texture; those which best resist pressure indicating that the worm has best accomplished its work. Too much care cannot be taken to remove the soft or imperfect cocoons, as if mixed with the firm ones they would be crushed, and soil the others with their contents. The very best of the firm cocoons are now to be chosen as seed for the next year, unless the raiser prefers buying his eggs to the trouble of caring for the moths and keeping the eggs through the winter. Eggs bought from large establishments are, however, apt to be untrustworthy, and it is well for all silk-raisers to provide their own seed. These cocoons should be chosen for their firmness, and the fineness and color of the silk, rather than for their size.

Mr. Crozier says: "If white, take them of the purest white, neither soft nor satin-like; if yellow, give the preference to the straw-colored, which are the most sought after; and, last, if they are the green of Japan, the greener they are, of a dark, sharp color, very glossy, the better is the quality of the thread. Discard the pale shades in the last breed." If there are any double or treble cocoons in the batch, of the right color, quality, and consistency, they should be used before the others, as they are just as good for breeding purposes, though unfit for reeling. In estimating the quantity that will be required, the following figures will be of use: The general estimate is always made of 40,000 eggs to the ounce, and also that each female lays from 300 to 400 eggs. Taking the higher estimate, it will require only 100 females to lay an ounce of eggs; taking the lower, it will require 133. It will, therefore, not be safe to take fewer than 200 cocoons, half males and half females, if an ounce of seed is desired, and from that to 225 would be safer. While it may not always be possible to determine the sex of the cocoons by their shape, we may approximately separate them by weighing. The whole quantity set aside for breeding purposes is first weighed in order to get the average, and then each one is weighed separately, and all above the average may be pretty accurately considered females and all below it males. These breeding cocoons should now be either pasted upon card-board on their sides, or strung upon a string, great care being taken to run the needle through the silk only and not deep enough to injure the chrysalis, the object being in both cases to secure the cocoon so that the moth can the more readily make its escape. They can be laid aside in a rat-proof place to await the appearance of the moths, and in the meantime the other cocoons should be taken care of.

Choking the Chrysalis. — In most silk-producing countries the parties who raise the cocoons sell them to the reeling establishments before suffocation is necessary, as these establishments have better facilities for this work than are to be found in private families. If, however, the reeling is done by the raiser, or some time must elapse before the cocoons can be sent to a reeling establishment, some means must be used to kill the contained chrysalis before the cocoon is injured for reeling purposes by the egress of the moth. This can be done by stifling them with steam or choking them by dry heat. Steaming is the surest, quickest, and best method, if the facilities are at hand: it can be done at any steam mill. The cocoons are laid upon shelves in a tightly sealed box, and the steam is turned in. Twenty minutes will suffice to do the required work, and the cocoons are then dried in the sun. The dry heat method occupies a much longer time. The cocoons are placed in shallow baskets and slipped on iron drawers into an oven which is kept heated to a temperature of about 200° Fah. This should not be increased for fear of burning the silk. This operation lasts from two to twenty-four hours. A certain humming noise continues so long as there is any life, and its cessation is an indication that the chrysalides are all dead. Where the choking is well done there is little loss, only about one per cent. of the cocoons bursting at the ends. After choking in this manner, the cocoons should be strewn upon long wooden shelves, in the shade, with plenty of air, and, for the first few days, frequently stirred. After remaining on these shelves for about two months, with occasional stirrings, the chrysalides become quite dry and the cocoons will keep indefinitely.

Egg Laying — Reproduction. — In from twelve to twenty days from the time when the worm commenced to spin, the moths will begin to issue from the cocoons laid aside for

breeding purposes. They issue most abundantly during the early morning hours, from four to eight o'clock, and as they appear they should be taken by the wings and the sexes kept apart for a short time. The males may be readily distinguished from the females by their broader antennæ and smaller bodies, as also by the incessant fluttering of their wings. The females remain comparatively quiet, their abdomens being heavy and distended with eggs. A few hours after issuing, the sexes, in equal numbers, may be placed together, great care having been taken to destroy any that are at all deformed, in order to keep the breed as fine as possible. They should be placed upon paper or card-board, and the room should be kept as dark as possible in order that the males shall not uncouple themselves. For the complete impregnation of the eggs, the sexes should be kept together six hours, neither more nor less, and occasionally visited in order to replace those males which may have become separated. Should there, on this day, more males than females issue, the superfluous males may be put in a closed box and kept till the next day, when the state of things may be reversed. Should there, on the other hand, be a superfluity of females, a sufficient number of the strongest and most vigorous males should be uncoupled at four hours and placed with the unpaired females for six hours more. As the pairs are uncoupled at the end of six hours, care should be taken to injure neither sex. The female should be held by the wings with one hand and the abdomen of the male gently pressed with the other. The males may then be laid aside in a box, as there may be use for them before all the moths have appeared. After all the females are impregnated, however, their mates may be thrown away.

The females, as soon as separated, should be placed for a few minutes upon sheets of blotting-paper, where they will free themselves of a quantity of greenish-yellow fluid. From the blotting-paper they should be transferred to trays lined with cloth upon which the eggs are to be laid. This cloth should be of the smoothest sort of woollen stuff rather than of inen or paper, if it is desired to remove the eggs at a future time, as they will stick so fast o the latter that it will be difficult to remove without bruising them. Upon these trays they may be placed in rows, and will immediately commence depositing. It is advisable to tie up the trays at one end so that they incline a little, as the moths are then more apt to lay their eggs uniformly. They should also be kept in the dark, in accordance with the nocturnal habit of the moth. The temperature of the room should be kept at about 75°, and plenty of air given during oviposition. All of the thoroughly impregnated eggs will be laid in about twenty-four hours, and the moth should be removed after that length of time. She may continue depositing a short time longer, but the eggs should be kept by themselves and not mixed with the others. It will be well, also, if the best and purest breed be desired, to keep the eggs of those moths which were coupled with males that had been used before separated from the eggs laid by those which were coupled with virgin males. "The eggs are best preserved on the cloth where originally deposited, as they are protected by a natural coating of varnish, and, being fastened, the worms, when hatching, eat their way out better. For commercial purposes, however, they are usually detached during the winter by immersing the cloth containing them in cool soft water for a few moments; the moisture being then drained off by means of blotting-paper and the eggs gently removed with a paper-knife. They are then washed in soft water, thoroughly dried, and put away for keeping. All eggs which swim on the surface are considered bad and discarded. The Japanese producers sell their eggs on cards or cartoons made of coarse silk. The cards are placed in wooden frames, the rims of which are varnished, so that the moths — disliking the varnish — are made to confine their eggs upon the cards, which are consequently covered in a very regular and uniform manner."

Reeling Silk from the Cocoons. — If the mere rearing of the worm and the production of the cocoons is simple, the reeling of the silk is by no means so, as the greatest skill is required to accomplish the work properly, and the value of a hank of silk depends as much on the skill of the reeler as upon the quality of the original thread. In the best cocoons the silk will measure upwards of a thousand feet in length, and, though it appears single, it is in reality composed of two threads, which are glued together and covered as they issue from the spinneret of the moth with a glossy varnish, which enables the worm to fasten the silk where it wills, and which is soluble in warm water. In countries where there are steam-reeling establishments, it is generally more profitable for the small raiser to sell his cocoons, and not go to the trouble and expense of reeling by hand; but, unfortunately, there is no market for choked cocoons in this country, and the raiser will be under the necessity of reeling his own silk if he wishes to make the most of them. It will be desirable, then, in this article, to state the facts and principles which should govern the unwinding and reeling,

for the benefit of those who may wish to use single basins and reels worked by hand. In the great reeling districts of France, everything is brought to such perfection in the *filatures*, or reeling establishments, by the aid of steam, that the hand-reels have there almost gone out of use. But most of the silk is unwound by hand-power in China, and excellent silk may be made by dexterous management with a good hand-reel.

Raw silk is classified into organzine, tram, and floss. Organzine is considerably twisted and is the choicest. Tram is made from inferior cocoons and is but slightly twisted. Floss is made of the loose silk, carded and spun like cotton or wool. The thread of silk as it unwinds from the cocoon is valueless for manufacturing purposes, several of them combined going to make the staple of commerce. The persons employed in unwinding silk are mostly women, one standing or sitting before each basin, of which she has entire charge. The basin is made of copper, and, in the large establishments, the water in each basin is heated by steam, at the control of the operator. The cocoons are plunged into the water, when it is near the boiling point, and moved about so that the gum which fastens the threads becomes uniformly and thoroughly softened. They are then beaten with a small birchen broom, having the tips split, so that the loose threads readily fasten to them. After beating a short time, the operator gets all the cocoons fastened, and, taking the bundle of threads, shakes the cocoons till each hangs but by a single one. She now takes up five or more threads (*brins*), according to the quality of the silk wanted, unites them, and introduces the combined staple or strand (*fil*) into a little glass eye on one side of the basin. She then forms a second similar strand and introduces it into a second eye on the other side. The strands are then brought together, twisted several times, separated above the twist, and introduced into two other glass eyes or ringlets through which they are led, one to each end of the reel or *tambour*, which is kept revolving in a steady, rapid manner, and to which is also given a certain back-and-forth side motion. The great object in reeling is to get the threads uniform, rounded, well joined, properly freed from moisture, and so crossed on the reel that they will not stick or glaze, as it is termed.

These objects are attained by the twisting and the to-and-fro lateral movement of the reel, as also by properly regulating the distance between reel and basin. The uniformity of the thread depends on the skill of the operator, who must supply a new thread as soon as one begins to give out. This is called nourishing the silk, and is done by dexterously casting, with the thumb, the new thread upon the combined strand, to which it immediately adheres. In this she must use much judgment, for the silk of a cocoon gradually gets lighter and finer as it approaches the end, and the uniformity of strand does not entirely depend on the uniformity in number of the individual threads forming it. Whenever the silk rises in locks the temperature of the water is known to be too hot, and when it unwinds with difficulty the temperature is, on the contrary, too low. The operator is supplied with a skimmer with which to remove all chrysalides and refuse silk; also, with a basin of cold water in which to cool her fingers, which are being constantly dipped in the hot basin. This constitutes the whole operation of unwinding, but before the skeins, as they come from the reel, are ready for the manufacturer they must undergo still further manipulation. The staple is first passed through a cleanser, consisting of a clasp lined with cloth, which catches any loose silk or other matter that may be adhering to it. It is then further cleansed and purged by being passed through four similar cleansers (*purgeurs*), then twisted about 500 times to the yard, then doubled and again twisted about 400 times to the yard. It is finally run on to reels about 1½ feet in diameter, and taken off and twisted in a peculiar knot or hank. Through all these operations the oscillating to-and-fro lateral motion is kept up, so as to produce the diagonal crossing of the strands, and it will be readily understood that each staple is, in the end, composed of ten or more of the simple threads first spun by the worm. The loose or flock silk, together with all which, from one cause or another, cannot be reeled, is soaked in water for three days, boiled for one-half hour in clear lye, washed in rain-water, and when dry, carded, and spun it makes an inferior floss silk.

Food Plants of the Silk Worm.—The traditional food plant of the silk-worm is the Mulberry (botanical genus *Morus*). There are two species of Mulberry indigenous to the United States, namely, the Red Mulberry (*Morus rubra*) and the Small-leaved Mulberry (*Morus parvifolia*), neither of which is suitable silk-worm food. I have tried in vain to rear the worms upon *rubra*, but they either refuse its leaves entirely or dwindle and soon die upon it. The imported species which are most used are the white (*M. alba*), the *Multicaulis*, and the black (*M. nigra*). This last is inferior to the other two as silk-worm food. The mulberry grows readily, being easily propagated by cuttings or layers or from the seed. The white

mulberry, in particular, grows well from cuttings, and this is perhaps the readiest and most economical method of planting to secure a stock. The cuttings should be started in rows, three or four inches apart, in ground prepared by deep plowing and harrowing. They should be about six inches long, and should be cut just before an eye in every case. They should be almost entirely buried. The quickest way to get a supply of leaves is to grow dwarfs.

Set out the young trees from the nursery in rows ten to fifteen feet apart, and six to eight feet between the rows, and form the crown of the tree by cutting down to a foot or so from the ground. The height of the tree and its form are easily regulated by pruning, and upon this process depends not only the vigorous growth of the tree, but also the ease with which the leaves may be gathered when desired. The pruning may be done in February or March, either every year or every other year. All dead twigs and dried bark should be removed and the limbs kept as smooth as possible, as this greatly facilitates picking. The best time for planting is in the fall, from frost until December, and in the spring, from March until May. For growing standard high trees, a practical raiser gives the following directions: The cutting should remain two years in the nursery without pruning. The third year it is cut down close to the ground and transplanted. The finest shoot is then allowed to grow, and in good land it will reach a height of eight or ten feet in one season. The fourth year it is cut back to six feet or thereabouts. Then, the three or four terminal buds only being allowed to grow, all others are removed as often as they appear by passing the hand along the stem. The *Moretti*, a variety of the White Mulberry, is profitably grown in the form of a hedge, and the large size of its leaves makes it a very desirable variety.

Osage Orange.—The cultivation of the Osage Orange (*Maclura aurantiaca*) is so well understood in this country that there is no need of giving detailed instructions on the subject. Very generally used as a hedge plant in those sections of the country which are particularly adapted to silk-culture, its leaves may at once be obtained without any special investment of capital. Those who use this plant as silk-worm food must, however, bear in mind that the shoots from a hedgerow become very vigorous and succulent by the time the worms are in the last age. These more milky and succulent terminal leaves should be thrown aside and not used, as they are apt to induce flaccidity and disease. In avoiding these more tender leaves, and using only the older and firmer ones, especially when the worms are large, consists the whole secret of the successful rearing of silk-worms on this plant; and if care be had in this respect there will be no appreciable difference in the silk crop from Osage Orange as compared with that from Mulberry. Should the worms, from whatever cause, hatch before either Mulberry or Osage Orange leaves can be obtained, they may be quite successfully fed, for a few days, upon well-dried lettuce leaves. It will, however, be worse than a waste of time to attempt to feed them entirely on these leaves, or, in fact, on any other plants than the two here recommended.

Enemies and Diseases of the Silk Worm.—As regards the enemies of the silk-worm but little need be said. It has been generally supposed that no true parasite will attack it, but in China and Japan great numbers of the worms are killed by a disease known as "uji," which is undoubtedly produced by the larva of some insect parasite. Several diseases of a fungoid or epizoötic nature, and several maladies which have not been sufficiently characterized to enable us to determine their nature, are common to this worm. One of these diseases, called *muscardine*, has been more or less destructive in Europe for many years. It is of precisely the same nature as the fungus (*Empusa muscæ*), which so frequently kills the common house-fly, and which sheds a halo of spores, readily seen upon the window-pane, around its victim. A worm, about to die of this disease, becomes languid, and the pulsations of the dorsal vessel or heart become insensible. It suddenly dies, and in a few hours becomes stiff, rigid, and discolored; and finally, in about a day, a white powder or efflorescence manifests itself, and soon entirely covers the body, developing most rapidly in a warm, humid atmosphere. No outward signs indicate the first stage of the disease, and, though it attacks worms of all ages, it is by far the most fatal in the fifth or last age or stage, just before the transformation.

It appears very clear that no remedies are known, but that care in procuring good eggs, care in rearing the worms, good leaves, pure, even-temperatured atmosphere, and cleanliness, are checks to the disease. The drawers and other objects with which the diseased worms may have been in contact should be purified by fumigations of sulphurous acid (SO_2), produced by mixing bisulphite of soda with any strong acid, or, better still, by subjecting

them to a carbolic-acid spray from an atomizer. In this way all fungus spores will be destroyed. In fact it will be well to wash off the trays or shelves once in a while with diluted carbolic acid, as a sure preventive. It is the best disinfectant known to science. The cheapest kinds may be used with the same efficacy as the more expensive. Another disease, known as *pébrine*, has proved extremely fatal in Southern Europe, and for twenty years has almost paralyzed silk culture in France. It is a disease which, in its nature and action, except in being hereditary, bears a striking analogy to cholera among men. "The worms affected by *pébrine* grow unequally, become languid, lose appetite, and often manifest discolored spots upon the skin. They die at all ages, but, as in *muscardine*, the mortality is greatest in the last stage. It is hereditary on the mother's side, because the moth may have the germ of the disease and yet oviposit. Indeed, the eggs may be affected and yet look fair and good, the microscopic *psorospermiæ* not being visible, so that the only true test of disease or health is an examination of the parent moth; and by killing off all infected moths the disease can be controlled.

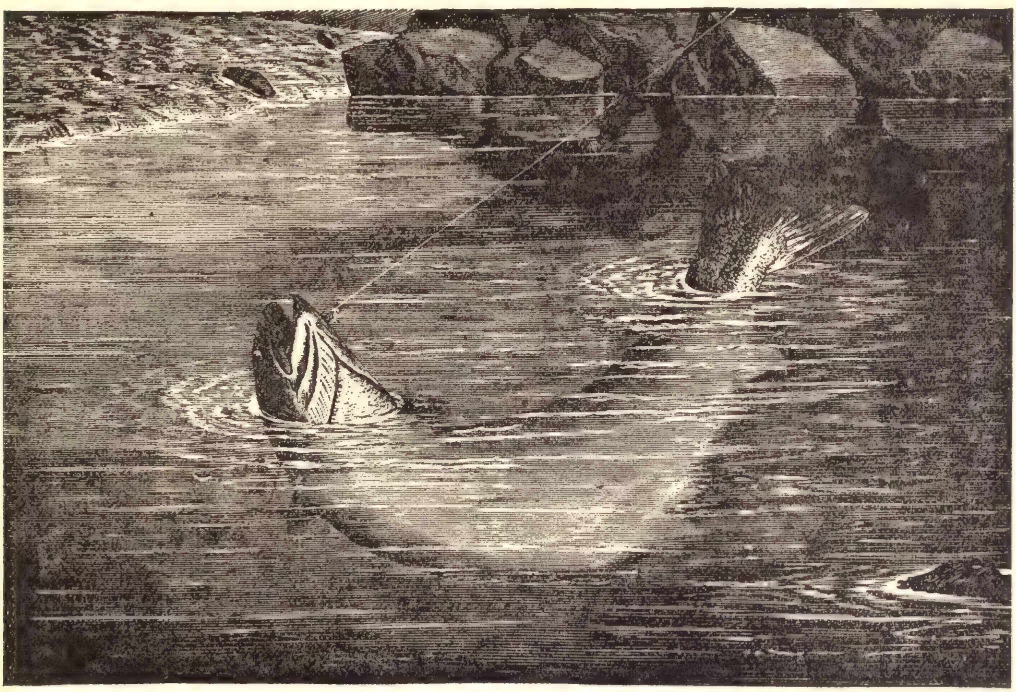
"Both the diseases mentioned are, therefore, in the strict sense of the word, silk-worm plagues; the one of a fungus and the other of an epizoötic nature. Each may become epidemic when the conditions are favorable for the undue multiplication of the minute organisms which produce them, or when the checks to the increase of such organisms are removed by carelessness or ignorance." Cleanliness and purification are absolutely necessary in treating both these diseases, and in *pébrine* care must be taken to see that the eggs are sound by a microscopic examination of the moths. This may be done after the eggs are laid, and if the corpuscles be found in the mother, her eggs should be discarded. Silk-worms are subject to other diseases, but none of them have ever acquired the importance of those described. What is called *gattine* by older authors is but a mild phase of *pébrine*. The worms are apt to be purged by unwholesome leaves; too great heat makes them sickly; or they may become yellow, limp, and die of a malady called *grasserie* or jaundice, which is almost sure to appear in large broods, and which is very common in those reared in this country. When the worms die from being unable to moult they are called *lusettes*, and such cases are most abundant at the fourth moult. All these different ailments, and others not mentioned, have received names, some local, others more general; but none of them warrant further notice here, as they are not likely to become very troublesome if proper attention and care be given to the worms."

Silk Culture in the United States.—There is no reason why the successful rearing of silk-worms may not be practiced in any portion of this country that lies south of 40°, the principal objections to be met being the expense of labor, and the want of a ready market for the cocoons. Professor Riley states that there is at present a general and wide-spread interest indicated in this country on the subject of silk culture. He mentions the obstacles to be encountered, and the fact that under a heavy protective tariff our silk manufacturers have rapidly grown in importance and wealth, until during the recent annual report of the Secretary of the Silk Association of America, raw silk to the value of nearly $12,000,000, and waste silk and cocoons to the value of $769,186 were imported at the ports of New York and San Francisco, while our manufactured silk goods reached in value between $35,000,000 and $40,000,000, and says: "The obstacles which I have set forth are none of them permanent or insuperable, while we have some advantages not possessed by other countries. One of infinite importance is the inexhaustible supply of Osage Orange (*Maclura aurantiaca*) which our thousands of miles of hedges furnish; another is the greater average intelligence and ingenuity of our people, who will not be content to tread merely in the ways of the Old World, but will be quick to improve on their methods; still another may be found in the more spacious and commodious character of the farmers' barns and outhouses. Every year's experience with the *Maclura* confirms all that I have said of its value as silk-worm food. Silk which I have had reeled from a race of worms fed on it, now for eleven consecutive years, is of the very best quality, while the tests made at the recent silk fair at Philadelphia showed that in some instances a less weight of cocoons spun by *Maclura*-fed worms was required for a pound of reeled silk than of cocoons from mulberry-fed worms."

Silk culture is admirably adapted to the invalids and children of the family, as well as to all other persons who desire some light and pleasant employment, as for instance those members of the farmer's household who are not otherwise engaged in more remunerative employment.

FISH CULTURE.

IT is no longer a novel idea that fish may be cultivated in nearly all waters to such an extent that there may be established a permanent and profitable business for furnishing an abundance of food of this kind. It seems to be within the power of man to multiply the inhabitants of the waters almost indefinitely by artificial propagation, he being subject principally to the limitations of the elements of sustenance, viz., a sufficient supply of water, and of food in the water. Statistics show that the salmon fisheries alone of Great Britain now aggregate in value over five million dollars annually, and that in one year the product of the rivers of Scotland, Ireland, and Wales that was furnished the London market was nearly four millions of dollars; also that the river Tay in Scotland yields an annual rental of eighty-five thousand dollars from its salmon fisheries, and that by artificial breeding it was increased to this amount within a few years from the sum of forty thousand dollars. The river Tweed yields its proprietors an annual sum of one hundred thousand dollars. We also



THE LAST STRUGGLE.

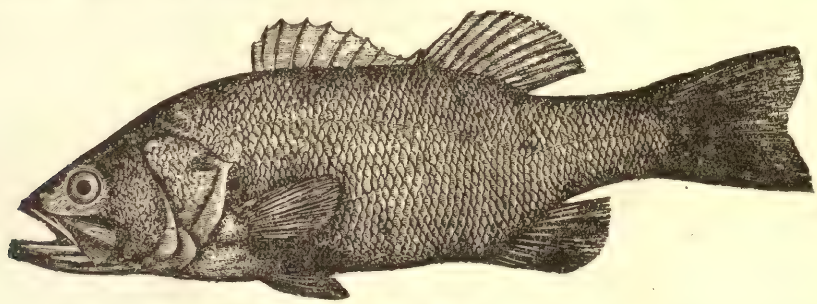
find that the salmon fisheries in the river Moisie, in the province of Quebec, increased in seven years by artificial propagation, from 75,000 to 204,000 pounds. It is but little more than thirty years since the artificial propagation of fish was commenced in Europe, and now it has become an established industry, France, which takes the lead, deriving an annual income of nearly twenty millions of dollars from her fisheries, Russia eighteen millions, Norway seventeen millions, and, as previously stated, Great Britain markets of one kind of fish alone over five millions of dollars. While in this country fish culture has received but comparatively little attention, it having been but a few years since the first efforts in that direction were attempted, great advancement has been made during that time, in developing this art.

Although the artificial propagation of fish might be called a new science among the higher civilized nations of the earth, yet it has been long practiced by some of the heathen nations, especially the Chinese and Japanese, who for thousands of years have sustained, to a large extent, their dense population upon fish, a large proportion of which was artificially propagated. The French have the honor of originating fish culture in the manner at present

practiced among civilized nations, their efforts being attended with such marked results that other European nations were not slow in following their example.

Considerable interest has already been awakened throughout the country in regard to fish culture upon farms, or in private fish ponds. This may be easily done, and with but comparatively slight expense and labor. Almost every farm has some stream or pond that may be utilized for this purpose, or if not, at least land of a low, marshy, swampy nature, that is almost worthless for any agricultural purpose whatever, but which might be transformed into a fish pond, and made more valuable in the production of fish than any equal area of the very best land for any agricultural product. Fish of suitable kinds bring a good price in the market, many—such as the brook trout, salmon trout, etc., frequently commanding exorbitant prices. But when it is not desired to supply the market, simply an abundance of fresh fish for family use, fresh from the water, is of no small import, and is a luxury that few families far from a market ever enjoy, since no food of any kind deteriorates in quality so quickly by keeping as fish. For the following practical directions on the breeding and management of fish we are indebted to Mr. Seth Green, Superintendent of the Fisheries of the State of New York; also noted in this country and in Europe for his valuable experiments and discoveries in the art of fish culture.

Points in Fish Culture.—"The following points upon fish culture seem to be established: First—Fish culture, extending to every desirable variety of fish, is entirely practicable. Second—It may, under proper management, be made profitable to the producer; as much so or more than the cultivation of land, or of land animals, and on similar conditions. Third—It may furnish to all classes an abundance of cheap, and the most nutritious and healthful food. Fourth—It is absolutely necessary in order to the preservation of the fish of the country from total destruction. Fifth—Every section of our country, and all its



BLACK BASS.

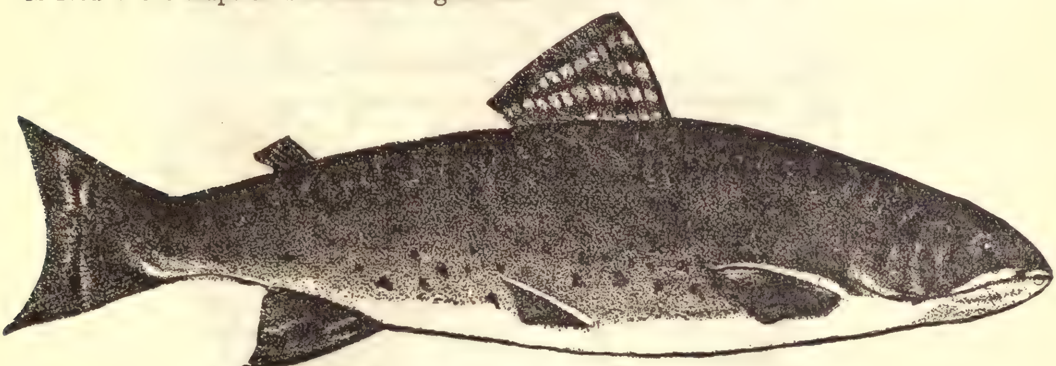
creeks, rivers, lakes, and seacoasts are available for this, care being taken that the right kinds of fish be selected for the water into which they are placed, observing latitude, climate, temperature, and quality of water. Sixth—It may be carried on by stocking waters with young fish brought from hatching establishments, or by obtaining eggs for hatching, and both eggs and young fish may be transported safely to almost any distance. Seventh—The money capital required for these operations is small, skill, care, patience, perseverance, and common sense, the same as in any other business, being the chief requisites. Eighth—Individual enterprise is alone sufficient for success, though State action is desirable; indeed, legislation is essential, if not to foster, at least to protect those engaged in the business of fish culture.

Varieties of Fish Best Adapted to Fish Culture.—The fish of North America are the finest in the world for food and sport, while some species have peculiar recommendations to the fish culturist. Probably the most valuable variety to be found anywhere is the shad; it is scarcely surpassed for the table, it is among the most prolific, it is the most easily manipulated, its eggs hatch in the shortest time, its fry require no care after birth, and being migratory, it draws its sustenance from the sea while it travels far inland, in its periodic visits to the land. We have abundant varieties for the vast extent of valuable waters in our states, from the sluggish, turbid streams and ponds of the South, to the lively sparkling spring brooks of the North; from the smallest ponds to the immense inland seas of fresh water. For the lakes the Whitefish, Salmon Trout, Herring, Black Bass, and Wall-eyed Pike; for the rivers, the Yellow Perch, Black Bass, Shad, and Salmon; for still and deep streams, the Bullhead or Catfish, the Perch, and many other kinds of coarse fish; for the swift mountain

stream, the Trout, Gold Fish, a good coarse pan fish, can be grown in all our rivers and bays. Beyond doubt, with very little care and expense these fish can be made to abound in our waters. But for some kinds this requires government aid, since individuals owning parts of streams will not hatch out fish there at their own expense for the benefit of all other owners of the stream, and special legislation seems to be required to get fish passes constructed over the numerous dams in our rivers, and to prevent substances destructive to the fish being thrown into our streams, such as saw-dust and the refuse of paper mills, tanneries, and dyeing establishments.

But if with comparatively little care and expense our great rivers can be stocked, in the meanwhile there is room enough for private enterprise. There are few farmers in our country who do not have upon their land a lake, or spring, or clear running stream. If these men knew how easily they could turn this water to profit, not only by raising food for themselves, but a supply for the city and village market, there would soon be very few waters without their finny inhabitants. How much this would add to the wealth of the country any one can see at a glance.

As the shad are probably the best and most valuable fish for the public, so is the trout wherever it belongs or can be acclimatized the most desirable for individual purposes. The shad yields the largest amount of food, while the trout holds the highest price in market, and possesses as a subject of sport a still higher value. Where neither shad nor trout can live some variety of the fresh water bass will answer for private or public waters, and the pike perch (wall-eyed pike) is admirably adapted to larger rivers and lakes. There is hardly any pond, stream, river, or lake, be it large or small, that cannot be utilized, and the land owner that has not the facilities for raising salmon may supply his family with an excellent article of food in the shape of bull-heads or gold fish.



THE ANGLER'S PRIDE.
BROOK TROUT (*Salma fontinalis*).
(Two-thirds full length.)

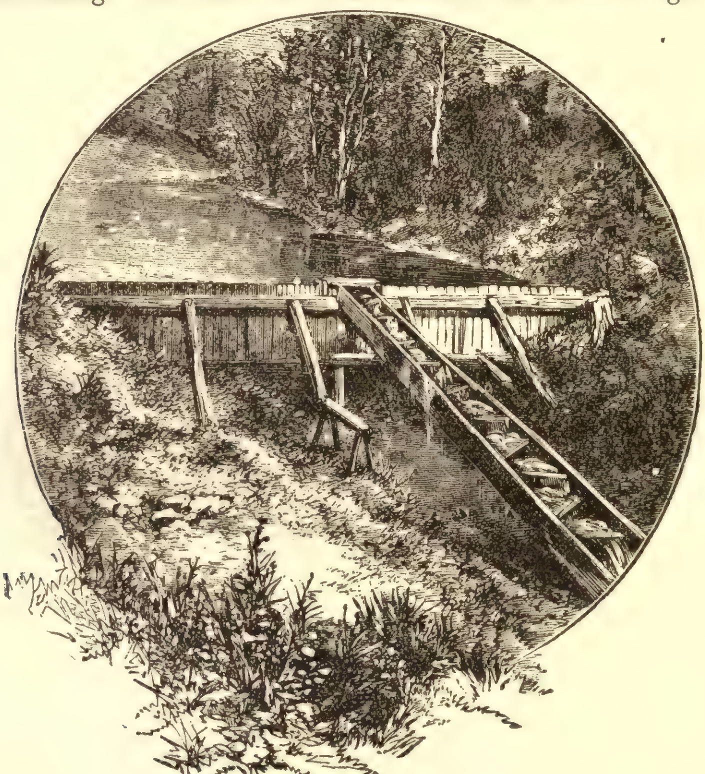
The number and kinds of fish that are treated are increasing daily. The Chinese probably confined their efforts to carp. We began on salmon. Then the effort was extended to trout, then to shad, to salmon trout, to whitefish, to striped bass, to sturgeon, to smelt, to grayling, and indirectly to black bass, strawberry bass, oswego bass, pike perch, yellow perch, catfish, oysters, lobsters, gold fish, and other fresh water fishes, and we may confidently expect in time, to assist nature in multiplying all or nearly all the fishes that live on our coast or in our lakes and rivers. Not a year passes but some new and valuable discovery is made, and the importance and interest of fish culture increases with every development.

There are certain well marked eras in fish culture in which the main discoveries have been made. Most of the appliances adopted abroad have been abandoned with us, and great strides have been made in developing the art. Our first great discovery was what is known as dry impregnation, that is, the use of little or no water in impregnating the eggs with the male fluid. This was kept a secret, however, from the public until it was re-discovered in Russia. Here it was first practiced in 1864, and up to that time twenty-five per cent. of the eggs was the greatest number impregnated; immediately afterwards the proportion rose to seventy-five per cent. and is now ninety-eight. At present "dry impregnation" is universally adopted.

The next great discovery in appliances was the shad hatching box, which has never been superseded for certain classes of fishes and situations, nor has it been improved on since it

was invented. Another seemingly trivial but extremely important discovery was the application of coal tar as a coating to wood work and all articles that come in contact with the eggs, and on which fungus could do harm by growing. The last was the invention of the Holton hatching box for hatching white fish, but which is a valuable convenience in managing the eggs of all the salmon and trout. These discoveries have reduced the labor and expense of fish culture immensely, and have added in an equal degree to efficiency and certainty of success.

Trout Ponds, Location, etc.—It is very easy, with good spring water, to raise a *few* trout anywhere in temperate latitudes. But to raise a large number requires care in the selection of a location. Plenty of pure spring water is the first and most essential requisite. The spring, or one of the springs, if there are several, should have a fall of two or three feet, and a fall of five to ten feet of the whole volume of water is decidedly advantageous. If the supply of water is very large, it diminishes the necessity of a fall. The water from a spring remains (near its source) at nearly the same temperature during the whole year, and is the best for trout raising. The water from a brook which does not rise higher than sixty-



POND AND FISH-WAY.

five degrees in summer may be used to supply ponds for adult trout; but spring water is not absolutely necessary for hatching purposes. It is not a good plan to dam up a stream which varies in volume, and so make ponds. There should be enough level land by the side of such a stream to make ponds supplied by the stream; and it is best to have a stream much greater in volume than is necessary for the ponds, so that there will always be a good supply of water, and there will be no trouble with the surplus water after a freshet. A good knowledge of the whole system of Trout Culture is essential in choosing the very best location. It is desirable to have your ponds near your house, or have a man in charge living at the ponds. Of course your trout may never be molested, but "an ounce of prevention is worth a pound of cure."

Laying Out Ponds. — A series of ponds, in all of which the same water is used, is generally considered the best plan for several reasons. It economizes the water and space,

and is most convenient for changing the fish from one pond to another. It is not necessary that the ponds should be in a straight line. Where the location demands it, they may be turned so as to lie in a direction nearly or quite parallel with one another. This is easily done by bending the raceways, and lengthening them if necessary, only a curved raceway is sometimes not so convenient as if it were straight. The sides of the ponds may be walled up with stones, laid without mortar, unless the soil is very sandy. Wood may be better for the sides and bottoms, but we are inclined to think is not worth its expense. If the sides of the ponds are laid up with mortar, let it dry thoroughly before letting the water in; then let the water run through it two or three weeks, or long enough to purify the pond before putting any fish in it. It is as well to test it by putting in only a few fish at first; if the pond is not thoroughly purified, the fish in it will turn blind. Ponds should not be built where much surface drainage will run into them; if they are so exposed, the surface water should be carried off by a ditch around them. The second and third ponds should receive an additional supply of water. If the supply of water is small, it is best to have as much fall between the ponds as the nature of the ground will allow. This fall aerates the water, and makes it as good as new.

HATCHING HOUSE, NURSERY, AND POND.

Shape of Ponds.—Where the supply of water is large, it matters very little about the shape of the ponds. The best shape we believe to be the pear shape, such a shape combining an equable flow of water in all directions, and the greatest amount of surface with the least difference in the temperature of the water. If the nature of the ground demands other shapes, the ponds should be made long, narrow, and deep, rather than broad and shallow. The depth of the first pond should be 2 feet, the second 4 feet, and the third 5 feet. These depths will answer for any size of ponds. It is better for any one wishing to raise a large number of fish, to have several series of ponds, than to attempt raising a larger number by increasing the size of the ponds. Fish do not feed so well in large ponds, are not so easily taken care of, and eat each other more.

Raceways. — The second and third ponds should have a long, narrow raceway where the water enters — about thirty or forty feet long, four feet wide, and six inches deep. The sides of the raceway should be made of one and a half inch plank, one foot in width. This will answer for both natural and artificial impregnation. The raceway is required not only for the purpose of spawning, but as a resort for the fish at all seasons of the year. Fish will go into this shallow graveled race, into the quick-running water, to free themselves from the parasites which often trouble them; or they will go there if they are out of health and condition from any cause. This raceway must be filled with coarse gravel, and the bottom of the pond made to slope gently up to the raceway.

The head of the raceway is to be carefully looked after. If a series of ponds are made, then the screens between will keep the fish from running from one to the other; but if single ponds are used, each supplied with separate water from a stream, then much attention must be paid to the screens where the water enters. It would be well if the water was brought into the pond through a long box, as the water will very soon work around or under a short box, and allow the fish to escape. If the water enters with a fall, it may be allowed to pour over upon an apron, constructed of thin slats, one-half or one-quarter of an inch apart, and set edgeways. This will let the water through, and keep the fish from running up. Trout will run up stream very freely, working their way through a small passage, but will not try much to run down stream.

Wild Raceway. — If the ponds are connected with a stream in which there are trout, it is desirable if possible to make a raceway below the lowest dam and connect it with the stream, so that wild fish may use it. In this way a great many trout will be taken in a ripe condition that would otherwise spawn in some other part of the stream and be lost. The wild raceway has the advantage not merely of utilizing fish that have not cost any expense to keep, but of adding to the number of spawners for the following year by the addition of those that are thus captured.

Bottom of Ponds. — It matters very little of what material the bottom is composed. Anything — mud, clay, or moss is good, except gravel, and this is bad, not from the nature of the substance, but because the fish will spawn on it and the eggs be lost. Sometimes a person will wish to construct a pond in a place where there are springs, or to dam up the water and make a pond in a springy place. Under such circumstances it is a good plan to fill the bottom entirely with gravel, as the fish would spawn there in any case. For such a pond make the borders very shallow, so that the little fish may run up into the shallow water and escape from the large fish; or have the pond so arranged that after the fish have spawned they may be removed. Thus the eggs will hatch out, and the little ones grow without danger. When the next season of spawning comes, the little fish may be removed into another pond, and the old ones let in again to spawn. Such a pond is good for any one wishing his establishment to run itself, as with a little care he can raise many fish in it without much trouble. But the gravel must not be smaller than a hickory nut, and from that to the size of a butternut.

Very often the bottom of a pond is porous and absorbs the water as fast as it runs in, so that there is hardly any running from the proper outlet. If you are short of water and wish to use all you can get for another pond, it is best to cement the bottom. If you have no further use for the water, it makes no difference how it goes off; that is, if there are no holes in the bottom large enough to let the fish escape, and the water keeps up to its proper level. Neither weeds nor mosses of any sort are necessary at the bottom, and if the supply of water is not large they will speedily become a nuisance. The quantity of trout food which they produce is of no account in an artificial pond where large numbers of trout are kept, and they tend to foul the water by hiding dead fish and bits of meat. It is best, if possible, to have ponds so arranged that they can be entirely drained. This is necessary sometimes for cleaning or repairing them, and changing the fish from one pond to another. If the slope of the ground is sufficient to permit of such an arrangement, it will often save much labor in pumping or bailing. The drain pipe may be of pump logs, tile, or pipe of any kind, and should be fixed in the lowest part of the bottom, or as near it as the level of the ground will allow. Still better would be a regular flume reaching from the bottom of the pond to the top. A bulkhead may be put in to raise the water as high as may be required, and a wire screen the whole size of the flume set a short distance in front of the bulkhead. This large screen has

an additional advantage, as the larger the screen the less liable it is to clog up with leaves and moss, and the greater will be the volume of water passing through it.

Screens. — Screens may be made of common wire painted with tar — as will be described hereafter — of copper wire, or of galvanized iron wire. The last is the best, as it will last longest in proportion to its cost. The screens for keeping the small fry should be of fourteen threads to the inch, and for one-year-old fish five or six threads to the inch. Incline the screens at an angle of forty-five degrees, the top being farthest down stream. By inclining the screens in this manner, a greater surface is exposed to the water than if they were placed perpendicularly. The sockets should be so made that the screens will fit tightly, and yet be easily taken out to clean.

A very good screen for two or three-year-olds can be made from strips of lath planed and nailed to a strong frame, with quarter-inch openings between them. Or, what is better, the slats should be at least four inches wide, so that if a leaf strikes against them it will catch without obstructing the flow of water and lie flat against a single slat, or if it reaches over the edge it will be carried through by the current striking upon one end. It cannot lap around the slat as it would if it were smaller. As for the width of the slats from one another, the point to be guarded against is the fish running their heads through far enough to strike their eyes, which will produce blindness. The distance they are to be apart will depend, consequently, mainly on the size of the heads of the fish, and as fish grow at different rates of speed it will not do to go merely by their age, but for fair-sized fish an opening of about five-eighths of an inch will answer. This refers to the upper screen; the lower screen, that at the foot of the pond, may be larger, as the fish are more cautious about descending where they cannot see their way, just as a man will climb a hill in the dark at his best speed, but will go down very cautiously.

Water Supply. — It is immaterial what kind of water is used, whether hard or soft. Neither will so-called "mineral water" hurt the trout, unless the water is very strongly impregnated. Trout have been known to live and thrive in a stream one-sixth of whose volume was supplied by a strong sulphur spring. The essentials are that the stream shall be reasonably pure, the volume of water nearly uniform, or so arranged that the supply taken from it is uniform, and the temperature between 36° and 65°.

One peculiar fact has been noticed in reference to the eggs, which is important to those persons who collect eggs to impregnate and sell. The shells of those taken from trout living in limestone waters are found to be thicker and harder than those obtained from soft waters. This may come from the lime in the water, and is an advantage in rendering the eggs more easy to transport with safety than where the shells are very delicate.

The supply of water necessary for a given number of trout is yet unsettled. For a series of ponds turning out one thousand large fish yearly, the water supply should fill a four-inch pipe. This question will be treated more at length hereafter; but it is always safe to have as much water as possible, for within reasonable limits one can hardly have too much — that is to say, if the dams and sluices are solid, and the screens do not clog. It must not be forgotten that abundance of pure water is as essential to fish, as abundance of pure air to man.

In saying that ponds must not have a gravelly bottom, we do not mean there should be no gravel. The trout must have access either to the raceway or some other spot of gravel to rub off parasites. This they cannot do if the bottom is wholly of mud, and they are excluded from the raceway.

The Hatching House.—If only a few eggs are to be hatched (say eight or ten thousand) no hatching house is necessary. The troughs may be placed in the open air, in any convenient place, and covered with a wire screen to keep out rats, mice, and ducks. A light board cover must then be laid over them to shed the rain and snow and keep the eggs from exposure to the sunlight. A hatching house is much more comfortable to work in. A stove may be put in it and a fire started occasionally for warming one's fingers, but it is not needed for hatching purposes, as spring water in these latitudes is warm enough. The house may be constructed of rough boards, or as expensively as you choose, but care should be taken to have a water-tight roof, as drops of water leaking through and falling into the troughs will kill the eggs underneath. Its size must be regulated by the number and extent of the troughs.

The windows in a hatching house should be few in number and provided with curtains or shutters, as the sun shining upon the spawn will kill it. Not that a few minutes exposure to the rays of the sun will hurt the eggs, but a few hours exposure certainly will. Perhaps it

would be as well to have the windows, if possible, made on the north side of the hatching house, into which the sun will not shine in the winter season. Keep the hatching house clean. In fact cleanliness is one of the cardinal virtues to the trout raiser. He should have a clean house, should work with clean hands, and have all his pans, spoons, and utensils of every sort free from grease and dirt.

Troughs.—These should be made of seasoned timber one and a half inches thick. They should be six inches deep and about fifteen inches wide, inside measurement. It would be better, perhaps, if the troughs were eight or nine inches deep, because then the water could be raised higher over the young trout after they are hatched out. The difficulty in making them so deep is that when the sides of the trough are made so wide they are apt to warp or stretch apart at the top, and must be stayed in some way ; for instance, by strips nailed across. But the cleaner the trough is of all strips, elbows, or grooves the better. The troughs are divided into squares or nests by cross strips set on the bottom at intervals of eighteen inches. The reason for this division into nests and for these cross strips will be seen further on. These strips may be made of half-inch stuff and cut two inches in width. There is no necessity for nailing them to the bottom ; fit them in accurately and set them edgeways at intervals of eighteen inches. As they do not need to be removed often, it is better to make them fit tightly. Other strips of the same stuff must be provided to fit upon these, and made wide enough to raise the water within an inch of the top of the trough; as these need to be often moved they must be made loose enough to take out, and yet fit accurately enough to raise the water over them when they are put in. A groove is sometimes made in which to run the strips, or shoulders nailed to the sides against which to set them, but it interferes with the equable flow of the water. New wood under the action of water develops a slimy sap, therefore it is necessary to paint the troughs with hot coal tar mixed with enough turpentine to thin it to about the consistency of paint. Glass has been used to cover them, and the wood has been charred to prevent the growth of fungus, but nothing answers so well as gas tar, which should be used to cover every thing in the troughs or ponds, and where fungus can do harm. The troughs should have an inclination of about one inch in eight feet—just enough to let the water ripple gently over the cross strips. They should not be longer than twenty feet, or the air in the water will be exhausted before the water reaches the end of the trough. There is more danger of this after the eggs are hatched out and the troughs are full of young fish. If possible the hatching house should be so far below the level of the spring from which its supply of water is derived, as to allow the troughs to be raised two or three feet from the floor. Where a large number of eggs are to be hatched, the inconvenience of stooping to care for them is very great.

Water Supply.—From the filter, the water runs into the distributing trough or pipe, which runs along the head of all the hatching troughs. The water may be let into the hatching troughs by faucets, or through holes cut into the trough. These holes should be covered with netting, or the young fish will run up out of the troughs into the filter, or coarse gravel may be heaped up at the head of the trough through which the water will run, but through which the young fish cannot work their way. The supply of water for one trough should be equal to that coming through a three-fourth-inch hole with three inches head; just enough to make a gentle ripple over the cross-pieces. Be careful to get the troughs level crossways, and the strips true, so that when the water is running, it will form an equal current over every part of each strip along the whole length of the trough. If the water runs unevenly, the eggs will be washed into a heap if they are being hatched on gravel, and many of them spoiled for lack of proper circulation of water around them. This supply of water will be sufficient until the eggs are hatched out, when a somewhat larger supply can be allowed. The water should be brought directly from the spring in a pipe of some kind, in order to preserve the proper temperature and keep the water as free from sediment as possible; and for the same reason the spring should be walled up to its smallest possible dimensions. If any surface water naturally runs into the spring, a ditch should be dug around the spring to lead it off. If the muddy surface water is suffered to run into the spring which supplies the troughs, the screen will very soon be choked up, and the sediment will find its way into the troughs in spite of all precautions, and destroy the eggs.

Filter.—The filter is a box six feet long by one and a half feet wide, and one and one-half feet deep, in which four or five flannel screens can be placed through which to filter the water before it passes into the troughs. The coarsest and cheapest red flannel is the best. It will rot and must be renewed once or twice in a season. Red flannel will last twice as long as

any other. The flannel should be tacked on frames running in grooves set at an angle of forty-five degrees, (the top down stream,) so as to expose as much surface as possible to the water. If the hatching house is small, the filter may be placed outside, but is better under cover. If the spring is well protected the screens will not need cleaning very frequently. They should be cleaned as soon as they look dirty, however often that may be, and can be cleaned best by being taken out and washed with a soft brush.

A filter can be made with sponges placed in a box with the water introduced at the top and brought out at the bottom, provided there is fall enough. The box should be about thirty inches long and twelve wide, and a board perforated with holes should be placed below the sponges, and leaving a space between them and the outlet pipe. This will answer on a moderate scale where only a small amount of water is used, and only a few hundred thousand fish hatched, and the sponges will remain clean for months. There should be an overflow pipe from the top to make sure that there is a sufficient supply of water and to carry off the surplus.

Sediment falling on the egg keeps the water off and destroys its life as effectually as being buried in the ground would destroy a man's life. If sediment falls upon the eggs it may be removed by gently agitating the eggs with a feather, or better still, by creating a current in the water with a feather, which current the eggs will follow, and as they roll over, the sediment will drop off. But the trout breeder has no business to be troubled in this way. If his apparatus is rightly constructed, and his filter properly attended to, there will not be sediment enough in the troughs to hurt the eggs, from the time they are put in until the fish are hatched out. The pipe which is let into the spring should have wire netting around it where the water comes in, to keep out impurities. This netting should be spread out so as to give a greater surface than the mouth of the pipe. If the netting covers only the mouth of the pipe, every speck of dirt which lodges on the netting diminishes by so much the supply of water; but if the surface of the netting is increased, much of it may be stopped up without lessening the supply of water. The best way is to make a box, say one foot square for each inch of diameter of the pipe, and run the pipe through a hole in the middle of the board, fitting it well; then fit a screen of netting on the front side in grooves so that it can be taken out and cleaned. This should be looked after occasionally, but if the spring is closely walled up, and the netting placed beneath the surface of the water, it will not probably need cleaning through the season.

Gravel for Troughs.—The gravel for the troughs should be quite fine—about the size of peas. It is better to use wire screens, as will be explained hereafter, but where only a few eggs are to be hatched and it is important to avoid expensive preparations, gravel will answer. It was formerly used altogether, but is now almost wholly discarded. It is better to have it of a uniform size. Any kind of gravel is good which is free from iron rust, as that kills the fish. If the gravel is of some dark tint, the dead eggs, which turn milk white, will show very plainly upon it, and may easily be picked out. The gravel should be well washed before use, and we would even recommend boiling it, to destroy any eggs of insects which may be adhering to it. After the nests are prepared the gravel may be put in, one and one-half inches deep, which will bring it within one-half inch of the top of the cross-piece.

Implements. The implements of the fish-culturist are few and simple. A few feathers may be kept on hand to use in spreading the eggs when placing them in the troughs, in collecting them for packing, and moving them in the search after dead eggs. Several plans are in use for removing dead eggs from the trough. Some use a siphon to draw them up; others bend wire into the shape of a small spoon, or bend an eye upon the wire just large enough to hold the egg. We recommend the use of nippers. These may be made of wire or some elastic wood like red cedar, bent or cut into the shape of the letter U, elongated to about six inches, and with loops of wire at the ends about the eighth of an inch wide. These will hold the egg without trouble. A small homœopathic phial is used to examine the eggs. The manner of its use is to fill it with water, put in the egg to be examined, cork it, hold it up before the window in a horizontal position, and with your microscope look *up* through the side of the phial. This brings the egg which lies at the bottom of the glass within the focus of the microscope, and the water does not distort its shape. This seems to be a very simple thing, and hardly worth telling, but of the hundreds who have tried to examine eggs in our hatching house, not a half dozen got it right until told how to do it. The microscope need not be very strong; one magnifying eight or ten diameters is amply sufficient. A small net will be of use in removing the young fish and any refuse in the water from the troughs; it should be about six inches in diameter, in the shape of the letter D, with the handle on the middle of the

bend. It is very easily made by bending a wire in the desired shape, and twisting the two ends together for a handle. Thin gauze of some kind, like bobinet, should be spread over the wire so tightly that the middle of the net shall hang only a half inch below the level. An iron spoon, well tinned or silvered, is used to remove the eggs. Some six-quart tin milk-pans will be necessary, for a variety of purposes. Eggs may be counted most easily by measuring them. For this purpose take any small glass, such as a very small tumbler, for instance, count out 500 or a 1,000 eggs, and with a file make a mark upon the glass as high as they reach, and the measure is always to your hand.

A watering pot with a fine rose spout is used to wash sediment from the eggs on the seives, and a broom of wings is used to brush the screens of wire.

Improving Streams.—Where a person has a small stream on his place which is adapted for trout, but is not large enough to accommodate many, or grow them to a good size, it can, at very small expense, be made a considerable source of pleasure and profit. All that has to be done is, to dig small ponds or long, narrow holes, say three or four rods long, and five feet deep, and throw some logs or brush in them. If possible, lay the logs crosswise near the bottom, in order to have the water work under them and make a clean "scour."

ARTIFICIAL SPAWNING BEDS.

Then all that has to be done is to place some trout fry in the brook above the ponds. As the fish grow they will settle down into the ponds where they can find shelter and safety, and whence they can be taken with a hook and line whenever they are wanted; the danger of fouling around the brushwood being an additional excitement to the angler. The fish need not be fed, as food sufficient will accumulate upon the logs and brush.

Spawning Season—Salmon and Trout.—The salmon family of the Atlantic States, including the eastern salmon, the salmon trout, the brook trout, the whitefish, and the lake herring, spawn in the autumn and fore part of winter. The grayling spawns in March and April, the California salmon in summer, commencing the latter part of August, and the California mountain trout in spring, beginning with the middle of March. Trout commence to spawn about October. The colder the climate is, the sooner they will spawn. In Caledonia Creek the trout lay their first eggs about the 12th of October; the water standing then at about forty-eight degrees. In the preserves, where the temperature at that time is a few degrees higher, they begin to spawn about the 1st of November, and cease about the 1st of March. The length of the spawning season depends upon the equality of the temperature of the water. In streams where the temperature does not vary much, winter or summer, the

length of the season is three or four months, sometimes more, and in cold mountain streams it lasts only two months, closing by the middle of January.

Signs of Spawning. — As the season of spawning approaches, the difference of sexes shows more clearly. It is very hard in the summer to tell the difference between a male and female trout. By handling them much and watching them closely the trout breeder comes to know the male and female apart almost instinctively; but he would be puzzled to tell just *how* he knows it. The male is generally sharper jawed than the female at any season of the year, and lines drawn from his shoulders to his tail would be straight without any bulge in the middle, while the female has a rounder jaw, and even in summer is more protuberant in the middle. These are general signs, and by no means universal. It is only in the spawning season that difference of the sexes can be told with any certainty. As this season approaches the distinctions become more marked. The difference in size is one peculiarity, as the eggs grow large and fill the belly of the female. It will not do to mistake food for eggs. A trout recently gorged with food looks just like a female full of eggs; but the food soon disappears, as the trout is an animal of quick digestion, while the swelling caused by the maturing eggs gets larger as the spawning season approaches. The colors of the fish, also, are at that time a guide. The female turns to a dark and sombre hue, while the colors of the males grow very brilliant, a line of brilliant scarlet red often developing itself along his sides on the edge of the belly.

Natural Spawning. — As the spawning season approaches, the trout seek places in the creek adapted to the purpose. These places have a pebbly bottom in shallow water close to the spring or head waters of the creek. The trout will work their way up over the shallows of a stream clear to the source; but if there are springs in the bottom, which is the case with almost all creeks, they will invariably spawn there, without going up farther, or if they find a shallow place with gentle current and gravel bottom anywhere in the creek, they will use it. Very few of the eggs laid in such a place will come to maturity unless there happens to be a spring. The males sometimes go up the stream first. At this season the males engage in fierce contests for the possession of the females.

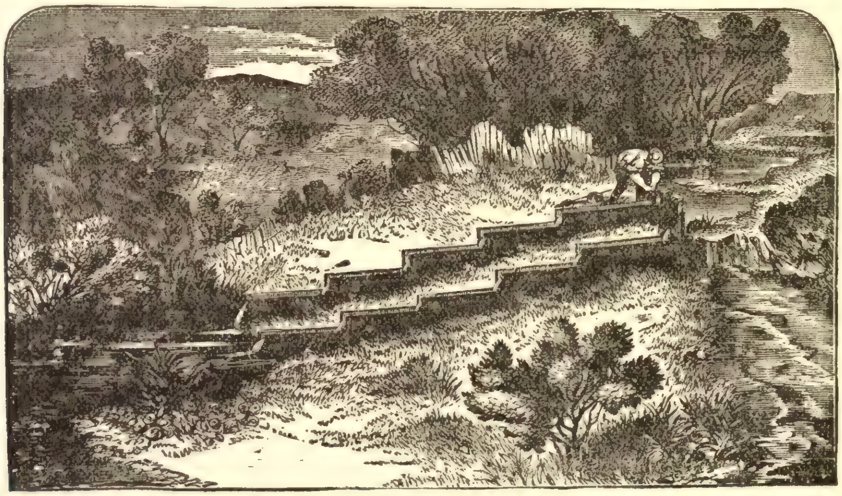
These battles often end in death to one or both of the contestants. That these battles are fierce, the deep wounds left on the dead bodies of the slain will bear witness. They have been known to fight for two days, and then both be killed. However, when they are once mated the battles cease and the pair are hardly ever seriously interfered with. Intruders in any quantity come around, seemingly out of curiosity; but, no matter what their size, they leave as soon as the husband, for the time being, darts at them. These intruders are, perhaps, waiting for a chance to devour some of the stray eggs which the female drops. The male and female being paired, go to the chosen place. They lie side by side together when not disturbed; but the male is occupied most of the time in driving off interlopers. It is very curious to see a little male with a big female in charge. Usually the little trout clears the way for the large one without a show of resistance. In the ponds when the trout are fed, the largest get the meat while the little ones get out of the way, and swim to the further side of the pond, and even if the meat is thrown where they are they will not take it until they have waited to see whether it is not the pleasure of the big fellows to claim it. At the spawning season all this is changed; they will attack a trout three times their size if he comes within less than a respectful distance of the female. Often while the male is driving off one, another on the opposite side will make tender advances; quick as a dart the proper husband returns to chase the gay deceiver. In fact, his time is fully occupied with chasing off intruders. If they are too numerous the female will dart from the nest over which she hovers, to help her chosen mate.

A nest is made in the gravel by the female. It is simply a shallow hole about six or eight inches in diameter, and about two or three inches deep. This is made by diving down at intervals against the gravel, and as she comes up giving it a flirt to one side with her tail—nearly the same motion as may be often observed when trout dart down to the bottom and rub their sides against it to free themselves from parasites. The dipping motion is continued for some days until the nest is large enough to suit her. After lying over this for some time the female is ready to emit a portion of her eggs. The male lies by her side while she does so. However busy he may have been in driving off interlopers, he seems to know by instinct when the female is ready to emit her eggs and is always by her side. At the time she emits her eggs he emits his milt over them. They do this with a curious curl upward, which every trout breeder should see for himself. Very often the male and female lock jaws together and their heads slowly rise, apparently trembling with excitement. They emit eggs and milt until

a nearly vertical position is gained, still lying over the hole, then they fall away from one another, and the male retires to some secluded spot, where he remains five or ten minutes resting. This interval the female employs covering her eggs. She will *flirt* in with her tail all the stones of proper size to be found near her nest, and if there are not enough to cover it to her liking she will go above, and, picking out a particular stone, work it down backward between the two ventral fins. This labor she continues until the eggs are completely covered.

After five or ten minutes the male pays her a visit to see how she is getting along. He looks around a little, eats a few of the eggs if he can find any uncovered, and then retires to his lurking place again, where he remains twenty minutes, with only occasional visits to the female before he recovers from the exhaustion which he has undergone. The female does not seem to rest; she continues covering the eggs and does not then leave the place. The reason for this is that she has not yet emitted all her eggs, for trout occupy some time in their spawning, laying their eggs at intervals, as they become ripe. Observers differ as to the length of time occupied in spawning. The time is not usually more than three days, although sometimes extending to six days, the female covering the eggs as she emits them.

When it is understood that some of the eggs do not sink into the nest, but are carried off by the current, and that only a part of every hatch escape the jaws of their parents, and of the many trout swimming around the spawning place, one may begin to perceive the advantage of artificial methods. To make the danger of loss greater, after the nest is finished, the



HATCHING BOXES.

parents gone, and the eggs nicely hatched, another pair come along intent on similar business. The female sees the place where the first has laid her eggs, and, fancying it a good spot for her own nest, begins to make one there. As soon as the eggs are uncovered, by the preparatory operations, the pair eat up all they can find, and then proceed to lay their own eggs, only perhaps, to be served in the same way by others. When it is considered, also, that all kinds of water-fowl are fond of these eggs and diligently search after them, and that in the spring time the young fry furnish a large proportion of food for the older ones, the wonder seems to be, not that there are so few trout in our streams, but that there are any left. Another cause of the rapid diminution of trout in settled countries, is the tame ducks which are allowed on the stream. They wander at will peacefully up and down the stream, explore every foot of the bottom, turning over the gravel with their long bills, and leaving very few of the eggs to hatch.

Number of Eggs.—The number of spawn which a trout will give has been variously estimated. She commences spawning at two years old if well fed and large. It has been asserted that eggs have been taken from a trout one year old, or rather taken in the winter of the same year it was hatched. This may be so, but it is more interesting in a physiological point of view than for any practical purpose, as there are so few that it is not worth while to

take them. A trout two years old will give from two hundred to five hundred eggs, a three-year-old from five hundred to one thousand eggs, a four or five-year-old from one thousand to two thousand eggs. This is only an approximation, as the number of spawn depends upon the weight and health of the fish, and not on its age. In some cases the number of eggs is much greater, but four thousand is the most we have ever seen taken from one trout. In estimating the number of spawn from a given number of fish in a pond, it must be remembered that some are barren, and some diseased, and some, perhaps, will not go up into the race. So that the average yield of two or three-year-olds, females only counted, will not be over five hundred, of four or five year-olds, not over one thousand each.

The proportion of males to females in a pond should be about one-half. Not so many are necessary to fecundate the eggs, and it would be an advantage in one way to have fewer, since then there would not be so much fighting in choosing partners, and as all the females do not spawn at once, one male would be enough to serve several females; but, on the other hand, the males seem to run out of milt before the females get through laying their eggs, and towards the close of the season it is often difficult to obtain males with milt enough to fecundate the eggs; so that it seems better to have in the pond an equal number of males and females, thereby giving more chance of saving some of the milt till the last of the season. The males are very amorous, and will pair again and again. It very often happens that some of them die from the exhausting effects of the season. The best way is to have an equal number of males and females, everything considered.

Taking Spawn by Hand.—The trout will not spawn in the ponds where the bottom consists of large stones or weeds; but if there is sand or gravel anywhere on the bottom of the ponds they will spawn on it. Therefore be careful to have all the raceway, where the waters enter, covered with gravel. In October this may be washed and cleaned from the weeds which will have grown in it during the year. As soon as the fish are ready to spawn they will ascend from the ponds into the raceway seeking a place to nest. Then they are ready to be taken out and the spawn expressed. At the entrance of the raceway there should be grooves to receive a frame on which is tacked a net of coarse bagging about eight or ten feet long. One corner of this bag should be narrowed, left unsewn, and tied with a string, like the mouth of a meal sack. The race should be covered over in spawning time, as the fish will come under the cover better and are not so likely to be frightened by any one passing. If there are fifteen hundred or two thousand fish in the pond the net may be used every day in the height of the season, and when the fish become scarce, once in two or three days.

Indications of spawning having been observed, the covers are put on the races, and as soon as there are fish in the raceway, the net is gathered up in the one hand and the frame held in the other, in such a position as to be put in the grooves as quickly as possible so as to let none of the fish escape from the race. Go quietly to the spot, and do not walk down the raceway to get to it, but approach from one side and put the net in the groove as quickly as you can. The water running down will swell the net out to its full length. The covers may then be removed, and with a stick you may frighten the fish down from the head of the raceway into the net. As soon as they are all in, the frame may be lifted out of the water, and the fish are then enclosed in the bag. A tub of water should be previously brought near the spot, and the end of the net can be lifted into the tub and untied, when the fish will all fall into the tub without any trouble. Coarse cloth is better for the purpose than netting, as it can be more easily tacked to the frame, does not hurt the fish so much, and lasts longer; besides, the water swells it out and holds it open for the fish to run in better than it would a net, and the fish not seeing you through the cloth as they would through an open mesh, are not scared, and do not try to run back up the race.

It must be remembered in this and all subsequent handling of the fish, that if the outer skin of a trout is broken or abraded by the hand or in contact with any hard substance, it will, in nineteen cases out of twenty, cause the fish to die. A white fungus appears on it first where the skin is broken; the fungus spreads over the fish until it is sometimes half covered with it before it dies. We speak of the covering of trout as "skin," because it feels like it and looks like it, although in reality trout are covered with minute scales. They will get over a deep and clear cut much more quickly than over a bruise where the cuticle or skin only is broken.

The fish being now in the tub, must be taken to the hatching house as quickly as possible. There are probably in the tub some fifteen or twenty fish, and all the operations must be conducted as quickly as possible, so that they will not die in the small quantity of water to

which they are confined. So long as the fish lie quiet in the bottom of the tub there is sufficient air in the water to sustain them, but as soon as they begin to come to the surface and try to leap out, it is a sign that the air is nearly exhausted and the water should be renewed. They will also open their mouths wide, just as a person would when gasping for air. The question has sometimes been asked how long a trout would live out of the water; the answer is, about as long as a man would live under the water. Trout will die in a tub out of which the oxygen has been exhausted by their breathing, more quickly than they would die in a cloudy day if out of the water entirely.

A fire may be made in the hatching-house to warm your fingers, which will probably get cool while engaged in this operation. A six-quart milk pan is to be provided, if you have many fish, and also another tub of water, into which to put the fish after they are deprived of their spawn. Select a fish, and holding it over the milk-pan, which has been dipped in water to wet it, rub it gently with the fore finger and thumb, from the pectoral fins to the vent. A little experience will show how this is to be done. If the fish is ripe, a few drops of pearly colored milt, or orange hued eggs, will be forcibly expressed into the pan. If the milt is not of this color, it shows that the milt is not good, and another male must be taken and treated in a similar manner. The female must be pressed more slowly and oftener than the male. If the eggs are not ripe, by passing the hand lightly over the belly, you will feel them beneath, hard, like shot. In that case put the fish back into the pond, for the eggs to ripen. When the eggs are ripe, the belly will be soft and flabby, and the eggs beneath the skin feel loose and change their position at the touch. So loose are they, that by holding the fish in a horizontal position, and then moving it up and down, the eggs will change, and fall downwards or upwards as if in a bottle. The operation must be continued until the fish are emptied of eggs and milt. The eggs in the pan may, at intervals, be gently stirred by moving the pan; this is to change the position of the eggs, so as to be sure that all come in contact with the milt, and when the operation is completed a half-pint of water is poured on them and the pan set in one of the hatching troughs through which the water is running; this will keep the eggs up to the proper temperature, and prevent a sudden change when they are transferred to the trough. The eggs will now agglutinate or stick to the pan, and to each other, for a little while.

In handling the fish, gentleness is essential. A trout, it is well known, may be tickled under the belly, and rather seems to like it, and will lie quiet in your hand while you are doing it. By putting the hand quietly in the water, moving it cautiously around the fish, and gently lifting him he may be raised high and dry, and will lie quietly without a struggle. There is a way of grasping a trout firmly, but gently, so that he cannot squirm, and yet not hard enough to break the skin.

The fish must be grasped by the head, if you are right-handed, with the right hand, and by the tail, or rather the lower part of the body, with the other hand, and held over the pan with the belly near the bottom of the pan. As soon as the fish is quiet, the right may be gently slipped down from the head, and the fore finger and thumb used to press the belly, the fish still being held by the tail and lower part, in the left hand, and partly supported, perhaps, by the sleeve of the coat, or by the bare arm, and the remaining fingers of the right hand. Every one will have a way in which he can do this best, and will find it out after a few trials. If the fish is large and struggles violently, the usual direction given in the books, is to let an assistant hold the head. We counsel you, if the fish struggles violently, whether it be large or small, to drop it back into the tub, manipulate another, and after a few minutes try it again; it will lie quiet after a while. If you attempt to hold a fish which struggles violently, you will be very apt to kill it. If, in addition to your own two hands, you get the two hands of an assistant on the struggling fish, there is not much chance of saving him alive. A better way is to file the barb off a No. 4 hook, then tie it with three feet of line to a pliant switch three feet long. Hook your fish on this, through the jaw, and holding it in a tub of water, let it struggle until it is exhausted. Then the hook can be slipped out, no injury having been done to the trout, which can be handled without difficulty.

The large trout are harder to handle, struggle more violently, and are more apt to be killed than the smaller ones, and do not average so many eggs, although now and then one will have a very large number. Therefore, we consider that the best fish for breeders, when the operation is conducted by hand, are those weighing from one-quarter of a pound to one pound.

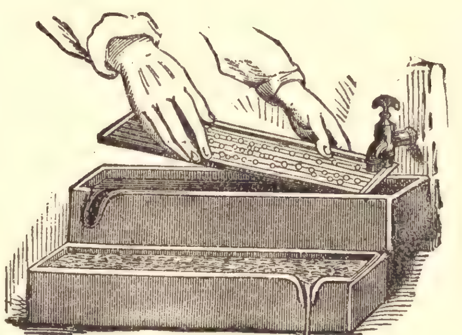
The pan should be elevated at one side, during the operation of taking the spawn, by standing it on a block half an inch thick, and enough water will drip from the fish so that by

tilting and shaking it the milt can be brought in contact with the eggs. Formerly it was the custom to half fill the pan with water, but now the eggs are mixed as dry as they can be, and it is found that a far higher percentage are impregnated. The milt seems to drown in water quickly. Only enough eggs should be taken to cover the bottom of the pan with a single layer. If more eggs are to be had, more pans should be used, and as soon as all the fish have been handled they should be returned to the water.

It takes very little milt to impregnate a large number of eggs, but, in practice, we generally take all the milt we can get out of the haul. It is sometimes our custom also to put the male fish, whose milt has been exhausted, into a pond by themselves, to keep them from running up into the race again and troubling the females. This is a very good plan, if you have plenty of ponds and plenty of fish. If you have but a small number of males compared with the number of females, put them back again into the pond, as they will probably have a second and third renewal of milt.

After stripping a female once she should be returned to the tub from which she was taken, and should be stripped again after a short time during which other fish are being handled. This is to get the last egg from her, and if it is not done a few will remain, and she will go on the spawning beds to deposit them, as if she had a full supply. If she is cleaned entirely she will not bother herself or her owner about the matter again that season. The California mountain trout retain their eggs and milt with more determination than our

DISCHARGING OVA.



IN-DOOR HATCHING BOX.

brook trout, and must be humored like a cow that will not give down her milk to any one but the creature for which nature intended it. After the trout are handled they are returned to different tubs according to their sizes, as this is the occasion that we take for sorting them, and then they are returned to their proper ponds.

Twenty to twenty-five minutes having now elapsed since the pan of eggs was set in the trough, gently tip up the pan. If the eggs are loose and roll separately as you move it, they are ready for subsequent operations; if not yet loose, let them remain a while longer.

The semen of the male is full of *spermatazoa* or animalcules. These will live for ten or fifteen minutes in water; dry, they will live six hours. There is a hole for the reception of these sperms in each egg. The egg always sinks into the water with this hole at the top. It receives one of the animalcules only by this opening, which then closes. There seems to be a special arrangement of Providence that the eggs shall agglutinate—stick fast to each other and to everything they touch—so that they shall not float away until they are impregnated and the trout has had time to cover them. In the eggs of other fish, such as bass and perch, the same arrangement is seen; only they stick fast the moment they touch anything, and stay there until hatched out, while the substance that fastens the eggs of the trout dissolves as soon as the mother has had time to protect them.

The eggs will now be loose and lying on the bottom of the pan. Pour off the dirty water until only sufficient is left to cover the eggs. If this is done very gently, the eggs, although very light, will remain at the bottom, as they are somewhat heavier than water; then sink the pan into the water, at the same time tipping it as described in the chapter on "Eggs," and take it half full of water. The influx of water will wash the eggs around somewhat, and dilute the dirty water remaining in the pan. This is to be poured off, as before, and the operation repeated until the water looks perfectly clear. There will be some dirt and droppings of the trout still left, which can be carefully picked out with the nippers. If an egg should happen to be broken while being taken from the trout every vestige of it should be carefully removed, as the slimy, sticky contents will get on the other eggs and kill them. The eggs are now ready to be placed in the trough.

From the above description it will be seen that a few lessons in artificial impregnation from an experienced hand will probably save the beginner much time and money. A written description of the process, however good, can never take the place of verbal instruction; partly because it never conveys exactly the same idea to all, partly because seeing a thing is better than hearing about it, and mostly because a written description is a general one, and hardly ever tells of the minutiæ and variations which constantly occur in practice. As an example of this it has been urged, all through this book, that in moving the eggs the beginner should not touch them with the feather, but should move the water over them, so that the eggs should follow the current thus created; also that he should be very careful, in removing the dead eggs, not to touch the others with the nippers. But we constantly move the *eggs* with the feather, and push to one side the sound eggs with the nippers, in order to get at the dead ones. The reason simply is that long practice has given the *knack* of doing it, without injury to the eggs, that a tyro does not possess.

General Management of Eggs—Placing in Troughs, etc.—The eggs of a trout are about one-sixth of an inch in diameter and nearly round. They are generally of a light straw or salmon color. The color varies with the meat of the fish; the redder the meat the more orange-colored are the eggs. They are generally of a light yellow or amber color at first, and grow darker as the eggs grow older. Their specific gravity is a little greater than that of water, so that they will sink in water, but may be easily moved in it. Suppose that the eggs are obtained and you have them in a shallow pan. The water in the troughs should be raised by placing a narrow strip across the trough upon one of the two-inch strips dividing the nests. Then sink the pan gently to the edge in the water of the trough, at the same time tipping the pan, so that the water in the trough and in the pan shall come together with as little current as possible. Then the edge of the pan may be sunk into the water, and by tipping the pan a little more the eggs will flow out without injury. By moving the pan while the eggs are running out, they may be spread uniformly over the bottom. If they fall in a heap, take the bearded end of a feather, and move the water with it in the direction you wish the eggs to go, and they will follow the current thus created. This may be done without touching the eggs with the feather. Distribute the eggs as evenly as possible over the surface of the nest. Where they are placed upon wire sieves, these may be moved and shaken under water so as to distribute the eggs evenly.

The strip which was placed across the trough to raise the water should then be removed. Care must be taken that it be not removed so suddenly as to cause a rush of water, which would carry most of the eggs away with it. Raise the strip a little way from the bottom, so as to let the water run out gradually, and when it is very nearly or altogether at the proper level the strip may be removed entirely. Those who have a nursery attached to the troughs place the earliest eggs in the lower end of the trough, and keep placing them toward the top, so that the fish which are first hatched can run first into the nursery without disturbing the others. We practice placing the eggs in the highest end of the trough first, because the eggs earliest placed hatch out first, and the water should be raised over them, as they require more oxygen than the egg. If these first should be placed at the lower end of the trough, in order to do this the water must be raised over all the eggs; if at the upper end, strips can be placed upon the nests in succession as the eggs hatch out and the water left running upon the unhatched eggs as usual. About ten thousand may be placed in each nest eighteen inches by fifteen inches.

If the eggs have been received from a trout breeder they should be left in the packages in which they have been sent until the troughs are ready for them. Persons will sometimes take the tin boxes containing the eggs out of the sawdust in which they were packed and set them in the water of their troughs, with the idea, perhaps, of getting the eggs in the box to

the same temperature as the water before unpacking them. This will surely kill the eggs in a few hours. Leave them in the original package until a few hours before you are ready to place them in the troughs. Then take out the tins and set them over or near the troughs, which will reduce or raise the temperature enough. Then empty the box into a tin pan full of water taken from the trough, pick out as much moss as you can readily with your fingers or nippers, and wash off the nest in the manner shown in directions for washing eggs hereafter.

If the eggs have had decent treatment on the way, that is, not thrown about roughly or set near a red-hot stove, you should find very few dead eggs in the boxes—not more than ten or twelve in one thousand. Should the eggs be found, on opening the box, to run together in lumps instead of being evenly distributed, and turned to a dead white or milky color, it shows rough usage on the way.

Temperature of Water and Time of Incubation.—The length of time required to hatch out the eggs depends upon the temperature of the water. A general rule sufficiently accurate for all practical purposes is this: At fifty degrees trout eggs will hatch out in fifty days, each degree colder takes five days longer, and each degree warmer five days less. The difference, however, increases as the temperature falls and diminishes as it rises. The best temperature for hatching is between thirty-five and forty-five degrees. We are inclined to believe that the fish hatched at a temperature of about forty-five degrees, and taking from seventy to seventy-five days to hatch, are stronger and longer lived than those hatched in fifty days at fifty degrees. It may be well also to note that the eggs earliest taken produce the best fish. The water of a spring can be reduced in temperature in winter by letting it run for a short distance exposed to the open air, or it may be collected in a pond and the supply either drawn from the pond or the stream, whichever is regarded as the most desirable. Another reason for delaying the hatching of trout is to bring them well into spring before they are turned loose, as at that time they can get more abundant food than they could earlier.

Growth in the Egg.—A great mistake is often made where eggs are to be distributed in retaining them too long after impregnation. This is sometimes done for convenience in shipping, and sometimes with a view of shortening the operation of hatching in the hands of the person receiving them, but it is all wrong.

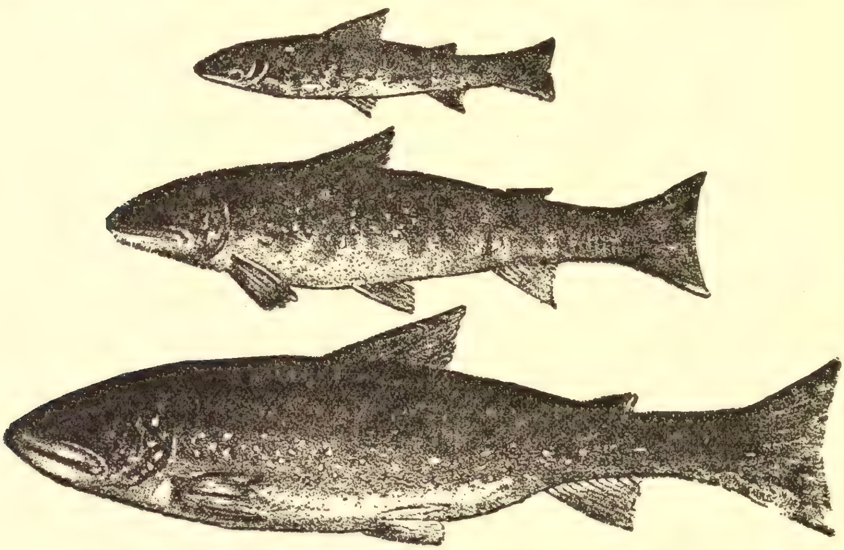
About the twentieth day the young fish can be plainly observed in the egg. Put a few eggs in a small phial, and with a magnifying glass the formation of the fish can be easily seen. Fish farmers should send the eggs away at this time. Some of the eggs are not impregnated, and at this stage of growth may easily be distinguished from the others. The dead eggs will turn to a milk or a pearl white color, and should be removed with the nippers as fast as they are discovered. If left in the trough a fungus growth forms upon them, which extends to the other eggs in the immediate vicinity and kills them. Care should be taken, in using nippers, not to hurt the other eggs, and to do this the bad egg should be feathered entirely separate from the rest; a very slight blow or jam from the nippers will be sufficient to destroy their vitality. Rats and mice in the hatching house often destroy many eggs; they are very fond of them, and, going into the troughs to get them, will destroy with their feet many more than they eat. A wire screen, or boards laid over the troughs, will keep them out; but it is a much cheaper way, and just as effectual, to keep them down by traps or poison. The eggs should be feathered over occasionally, so that their whole surface may be exposed to the action of the water.

Hatching Trout and Salmon.—After the eggs have lain in the water from fifty to seventy-five days, according to the temperature, the trout will begin to make their appearance, the egg appears to be endowed with life, and the motions of the trout inside "kicking" against the shell to force their way out can be plainly perceived without the use of a microscope. At length the trout forces his way through, head first or tail first, those that hatch head first always dying, however, and the useless shell floats away down stream. The trout is then about one-half an inch long, and the body proper as thin as a needle; the most prominent features being a pair of eyes, huge in comparison with the rest of the body, and a sac nearly as large as the egg. This sac is attached to the belly of the fish, and contains food, which the fish gradually absorbs. If the fish are hatched in fifty days, the sac lasts about thirty; if in seventy days, about forty-five. At this period of their lives they will work down into the crevices of the gravel and along the sides of the troughs and stay there, nature seeming to give them the instinct at this weak and defenceless period of their lives, when

they are burdened with a load which they can hardly carry, to get out of sight and out of the way of harm as much as possible. At this stage of their growth many curious deformities appear, more interesting perhaps to the physiologist than to the trout culturist. Some of the fry will have two heads, and some will be united after the manner of the Siamese twins. A very common deformity is a crook or bend in the trout, giving it a semi-circular form, so that when it attempts to swim it can only progress in small circles. All the deformed soon die, and may as well be removed from the trough at once. They live as long as the sac supplies them with food; when the sack is exhausted they cannot swim about to get food, and die of starvation.

This instinct of hiding will make the young fry very uneasy if they are placed in a trough without gravel. They will keep continually in motion, or will crowd upon one another in masses, each trying to work his way out of sight under the others. They must now be watched, and carefully moved from time to time if there is danger of their smothering.

Nursery. — The most critical period in the life of a trout commences when the umbilical sac is absorbed. More, perhaps, die from the time they begin to feed until they are six months old than at any other time. In consequence, many different plans for nurseries have been suggested and used. The fry require a largely increased supply of water, but where only a moderate number is to be raised, in place of erecting other and wider troughs or boxes for nurseries, the better plan is to put only a few eggs, say five hundred, into each square or



SALMON TROUT (ONE-THIRD FULL LENGTH).
(One, two, and three years old).

nest of the hatching trough. The square is then large enough with the water raised to keep the trout well for a month or two after they commence feeding, when they may be transferred into the first or upper pond. This plan economizes space, saves one removal, and the fish do better after a month or two in the ponds than they would in troughs or rearing boxes. It is better to remove the gravel from the troughs as soon as the fish commence feeding, because then the troughs can be kept clean more easily, else particles of food will lodge in the gravel, whence they cannot be removed. The water must be raised by the cross strip before mentioned as soon as the eggs hatch out. It would be well to fix a small screen in each alternate cross strip, which can be done by cutting out a space of eight inches by two, and nailing a fine screen over the opening. This will prevent the trout from running up and down in the troughs, and inconveniently crowding together.

The fry are removed from the troughs into the pond by the use of a small net, such as described among the implements of the fish raiser. Take them upon this, a few at a time, and put them in a pan of water; they will swim off the net, and you may draw it from under them. In the pan they may be carried, a thousand at a time, to the pond in which you wish

to place them. Put them into still water; they will settle down on the bottom, and remain there for some hours; then they will begin to explore their new quarters, and in a few days will become thoroughly habituated to the place.

Boards are sometimes placed over the outer edges of the preserves to give the fish a hiding place and shelter from the sun when they wish it, and, more important than all, to act as a trap for minks in case there is danger of these destructive creatures getting into the ponds; as the boards project nine or ten inches from the sides, if a mink gets in he cannot make his way out.

Where a large number of fry are hatched they have to be left in the troughs until they can be distributed, which is done as soon after the absorption of the sac as possible. In this case the troughs must have all the gravel removed, and must be kept scrupulously clean. A very little decayed meat will render the water offensive, and produce disease. This offensiveness does not show itself in the least in the appearance of the water, which to the eye may be as bright, clean, and sparkling as ever. It can, however, be often detected by the smell. When gravel has been for some time in the tanks or troughs where fish are fed, even with the utmost care, if a handful is taken up it will be found to be very offensive to the olfactories. As well might we expect the human race to be healthy in foul atmosphere as fish to be healthy in foul water. In the ponds it will sometimes answer to cover up or deodorize the feculent matter by throwing earth mixed with a little salt into the water and allowing it to settle; this not only covers the decaying substances, but disinfects them in a measure, on the principle that dry earth is used in the earth closet. The water is to be made quite thick and muddy with the earth, and the operation is to be renewed every few days, as often as necessary. The roiliness of the water does not seem to injure the fish. This, however, at best is but a makeshift, and the true plan, especially with young fry, is to keep the troughs clean.

Cleaning the troughs must be performed daily, in the morning and evening. A thin board, nearly as wide as the trough and shaped like a hand shovel, is made with a short stick for a handle nailed across it. When this is held in the water across the trough, it creates a strong current under it. It is held in the left hand, while in the right hand is a small brush broom, such as is used in cleaning sinks, and with which the sides and bottom of the trough are well scrubbed. All the dirt is sucked under the board, and carried along to the lower end of the trough. The fish are also crowded together ahead of the cleaning operation and out of the way of the broom. When the lower part is reached, the fry are driven above, and the operation completed by netting out the larger pieces of meat or dirt, and by rubbing the finer particles through the screen at the lower end of the trough; or a high cross bar may be put in, the screen raised for a moment, and the waste plug opened.

When there is not accommodation in the troughs for all the fry, and they cannot be distributed, a temporary place of retention may be made by using the shad boxes, which are described under the chapter on shad hatching. They need not generally be set at an angle to the current, as the mere ordinary disturbance of the water near the outlet of the ponds will give them motion enough to change the water. These will answer only temporarily, and must be cleaned as carefully as the troughs. They are to be scrubbed all over the inside and on the bottom. To do this without injuring the fish, the box is tipped up so as to bring one part after the other out of the water, where it can be brushed, while the fry are safely swimming at the other end.

If the fry must be kept in confinement, absolute cleanliness is a necessary prerequisite to their health; but we cannot too strongly impress upon our readers the desirability of turning them into the small rivulets connected with the waters where they are to live, as soon as possible after the sac is absorbed. Although they encounter some perils to which they are not exposed if kept in preserves, they escape still more dangers and acquire the habit of taking care of themselves, which is necessary when they come finally to be thrown upon their own resources.

Food of Fry.—The best food for trout fry is raw liver, chopped as fine as possible, and then rubbed through a screen or sieve with a flat stick. It must be reduced to the consistency of pulp, and contain no strings or gristle. A chopping machine is made for chopping hash and sausage, and either that, or a couple of sharp knives are used to chop the liver. What is used is mixed with water so as to reduce it to about the thickness of cream. A teacup full of this mixture will feed a hundred thousand fish when they first begin to feed. The best way to feed them is to take a case-knife, dip it into the food and *slirt* off what adheres into the troughs; a very simple way, but one answering all practical purposes. Care should

be taken not to feed too much, else the surplus food will remain on the bottom, and decaying there, foul the trough. The reason of the difficulty in raising young fish, appears to be that they are literally starved to death. The food which we can give them is not natural to them, it is often given in such coarse pieces that they cannot take it, and sometimes, through the carelessness of a hired hand, they are neglected two or three days at a time.

It is impossible to get natural food for the fry, in fact no one knows what it is, further than that it must be microscopic insects of some sort, as the adult trout are never known to feed on anything but animal food. It is found in the spring runs, even actually in them; as they apparently issue bare of life from the bosom of the earth. Liver is but a poor and unnatural substitute for this food, with fish so delicate as the trout, and if they once get the habit of feeding naturally on what the water offers, they will not take the artificial food afterward. Fish, of any age, learn to eat that food which is most abundant around them. Anglers know this by experience, and use the flies which they see on the stream on which they are fishing. It is supposed that a trout is very fond of grasshoppers, but the trout in one of our ponds which we have fed for a long time with beef lights, will not look at grasshoppers, and will turn up their noses at the fattest and juiciest worms, while the trout fresh caught out of the stream, which we have put in a pond by themselves to educate, will for weeks refuse the daintiest bits of lights and liver. Hunger will after a time drive them to change their food; but with the young ones we cannot wait for this, as they will die off before they learn. As the fish grow older and stronger, more food must be given to them; when six months old, a bowl full of liver will answer for a thousand. When the fish are young, feed often; six or eight times a day for the first two or three months; three times a day will do after three months, until they are a year old.

Young salmon, young salmon trout, California mountain trout, and above all, young California salmon are larger, have stronger appetite, and will accept coarser food. For them, although at first the liver should be made as fine as for trout when they are a few weeks old, it will be hardly necessary to dilute it at all, and in the course of a few months, they will not only take the larger pieces, often tearing them apart, but will scorn the finer portion. At one time, sour milk was almost exclusively used for feeding young fish, but it has been given up. Other foods have been tried, but with no better success. The fish will not thrive on any of them as well as they do on liver, and do not thrive on that as well as if it were a natural food.

As they grow older, other things may be substituted, or may be added to it for a change. They are fond of the roe of other fish, of the spawn of the horse-foot or king-crab; of fish itself, and when they are large enough to eat minnows, no better food can be given them. Liver is too expensive when it has to be used alone for grown fish, and beef lights are usually added to it or used in place of it in a measure. It is miserable food, however, much of it passing through the stomachs of the trout and salmon wholly undigested and collecting in the bottom of the ponds. It injures the digestive organs and must be deleterious to the health of the fish. Its only recommendation is that it is cheap. Maggots are bred on spoilt meat, hung over the ponds, and as they fall off and drop into the water, are readily devoured, and make excellent food. Or a piece of spoilt meat may be placed in a deep bottle like a preserving bottle, and the flies that will collect in immense numbers during summer, may be caught and emptied into the water. This trap will take many times its bulk of flies by being kept set all the time, and emptied when any one is passing it. Flies are probably the best food that can be given to trout.

Food of Adult Trout.—In keeping large numbers of fish either for breeding or for sale, the first thing to be determined is, what is the best food which can be obtained cheapest and in the greatest quantities. This question is important because the profit depends upon it. All other circumstances being equal, he who can obtain the cheapest food will make fish raising pay the best. In France and Germany, dead animals are gathered from the farms around the fish establishments and made into *pates*, or pies, which are fed to the fish as wanted. However good this may be for the fish, it is somewhat repugnant to the taste of the fish eater. In this country we pursue a cleaner method. The pluck of animals killed (that is the lights, liver, and heart) is obtained from the butchers. This food can be obtained fresh at least once or twice a week in most localities, and kept fresh by means of an ice house. In fact trout will not eat decayed or spoiled meat unless they are very hungry. They are very dainty in their tastes, and will often go hungry rather than take anything which they do not fancy. We feed meat to them raw.

The lights should be given to the larger fish, as it can not be chopped as fine as the liver,

and is more apt to hang in strips or strings. The liver, which can easily be cut into small pieces, may be fed to the smaller fish. Trout will sometimes choke to death; they are so greedy that they attempt to swallow a very large piece of food, and it sticks in their throats and kills them. Often it is caught in their teeth and thus prevented from going down the throat, or it gets into their gills and stops their breathing. They will, when choking, come to the top of the water, and may sometimes be saved by taking the piece out of their throats, or pushing it down. But the best remedy is to chop the meat fine, say one-half or one-quarter inch squares for two and three years old.

No machine which we have ever tried would do the work of chopping to our satisfaction. A sausage machine runs the food together and mashes it, and the meat cutters, which do the best, require cleaning and sharpening so often, that they are only a nuisance. The best thing we have ever found is a butcher's block, or log of wood two and a half feet high on which to cut, and a very heavy knife or light butcher's cleaver. These instruments are very simple, not liable to get out of order, and do the work required of them in the best manner, and with no more labor than a machine would require. Sometimes two or three knives are fastened together to make the work go more expeditiously; but one is best, or at most one in each hand.

Fish fed on liver or lights are not as good eating as wild fish; this is especially so of trout, which should never be sent to market or the table directly from the stew pond. But they soon recover their flavor when they are turned loose, and made to seek their natural food in a natural way.

Any kind of meat is good for food. Trout are carnivorous and will not eat vegetables of any kind that we have ever tried. We feed them lights and liver because it is the least expensive food we can find in large quantities, and answers a very good purpose. In their natural state, trout feed upon insects of all descriptions which abound in or near the water; worms of all sorts, from the angle worm to the caterpillar, which the wind shakes from the trees bordering the stream into the water, are eagerly taken. Flies of every kind which either drop down upon the surface of the water to lay their eggs, or may happen to fall into it, are quickly devoured. Young fish which may be in the stream serve for food; so do grasshoppers and beetles which fall into the water, and even the crawfish is not spared. If any one will examine the bottom of a good trout stream carefully, he will find every stick, stone, and bunch of moss in it covered and filled with insects of various kinds. If you look at the bottom of the creek, also, when it is free from moss and sticks, you will see that in the summer time it presents a curious mottled appearance, as if it were having an eruption of some kind; these protuberances are caused by the larvæ of water flies, which, after a time, rise to the surface, and then breaking their shell or case, for the first time, spread their wings and fly away. On these, before they have assumed the fly-state, the trout feed; and the eggs of water flies, together with minute insects and worms, are the special food of the very young trout.

Fish of any kind are a very good food for trout. If they are small they may be put into the water whole, the trout will take them all the better if they are alive. Any coarse fish which can be obtained cheaply and in sufficient quantities, may be chopped up fine and used as food. As we said before, they will not eat carrion, unless pressed by hunger. They will eat a live trout, but we have never known an instance of their eating, or even touching a dead one. If any way could be devised of raising flies, or shrimp, or various kinds of insects (their natural food), in sufficient quantities and at little expense, this would be the best of all. A change of food would also do them good, but we find that they will not readily change their food.

As to the quantity of food necessary for a given number of trout. This is difficult to give exactly, as it will vary with the size of the fish and the season of the year, more being required in moderate weather than when it is very hot or very cold. For one thousand three-year-olds, about five pounds of lights or liver per day; for two-year-olds, three pounds; but a very little trial will show just how much to feed them. Feeding once each day will keep the trout, over one year old, in good condition. Feed slowly, and as soon as they begin to refuse the food, stop feeding them, then you have the measure, and feed a little less than this quantity every day. We say a little less because we have known cases in which owners of ponds being over anxious to fatten their trout, have killed them by over-feeding. Still this does not often happen, especially if they are fed regularly. A trout after long abstinence will gorge himself to repletion; but will not kill himself to-day if he is reasonably sure of to-morrow's dinner. All animals appear to be wiser than men in this matter, and it is very seldom that they will eat enough to do them injury, no matter how much may be given them.

Salmon and salmon trout, as we have heretofore remarked, will, when they are young, accept food that is rather less finely prepared Their food is of the same general kind, but as they are larger fish they need more of it. Salmon trout can be kept in confinement until they weigh ten or more pounds, whereas, the largest tame trout we have had did not exceed four; but few reached three, it being doubtful whether fish ever attain as full development in the domesticated as in the wild state. As salmon trout will grow to weigh a hundred pounds in Lake Superior, it is probable they may reach twenty in suitable preserves, although the largest we have is not over nine, but he is healthy and is still growing. Salmon trout have been taught to eat trout that died of a natural death; although they at first utterly refused such food, they came in the end to accept it willingly. Trout seven inches long have been disposed of in that way.

Trout and salmon, the latter especially, will get so tame after a time, that they will take the food out of your fingers, in fact they will take the fingers too. Their teeth are sharp, and make scratches like needles. They may be taught to jump for their food by holding it a short distance above the water, or may be made to come up and take it out of the pan you are holding. Feed in the middle of the day when the sun is well up, any time from ten to three is good. Make it a general rule to feed slowly, and give them as much as they will eat without wasting.

Although trout and salmon become so tame that they may be made pets, some hybrids in the State hatching works are so shy that they keep as much as possible out of sight, and can hardly be fed These were a cross of the milt of the salmon, with the brook trout eggs, and perhaps knew that they were monstrosities. There is a board covering to the edges of the preserve in which they are kept, and they hide under it and run hither and thither in fright and confusion if any one attempts to get a close view of them.

Salted food has been tried for the feeding of trout, but not with satisfactory results. They do not seem to like it, although it is possible they might be accustomed to it if any important advantage was connected with its use. It, however, ordinarily costs as much or more than the fresh meats, and cannot be superior to them. There is much of the offal of large cities which may yet be utilized as fish food. Where it is allowed to go to waste and run into the rivers adjacent to markets, it invariably attracts wild fish to such places, and if it is satisfactory food for them, it would be equally agreeable to their tame and less particular brethren. The fish breeder must not rely upon getting his food of any kind for nothing, as although most country butchers throw away their beef lights, they will put a price on them the moment they find they are in demand. Three cents a pound is the price usually asked for such food.

The size to which a trout may grow is not very well settled; so many "fish stories" have been told that discredit is thrown even upon well authenticated assertions. Trout may in exceptional cases and in large waters, attain the weight of eight or ten pounds, but a four pound trout is generally considered to be of pretty good size. This question of size is interesting rather to the sportsman than to the trout farmer. It is considered that small trout are the best to eat, those from one-quarter to one-half a pound. A better market may always be found for fish of this size than for any other.

Precaution Against Escape.—There will always be a difficulty in so arranging ponds, screens, outlets, and inlets as to keep the young fry in their proper pond. The water is very apt to work holes around the screens or rather around the boxes containing the screens. The young fry will make their way through a wonderfully small hole, no matter how long the distance may be. They will also get through between the screen and the socket, unless these are very well fitted together, and wherever there is a crack into which they can get their large heads, they will put them in so tightly that they cannot extricate themselves, but will die. In short, wherever you can run the blade of a jack-knife, there the young trout will go. In making a pond for them, it is best to beat the edges with a spade until they are perfectly smooth, or, better yet, to put a board around the edges to the depth of a foot.

Cleaning Screens.—If the screens are not kept well cleaned, two consequences follow. First, the water runs over the top of the screens instead of through them, and the young trout escape; and second, when the screens are taken out to be cleaned a rush of water follows their removal, carrying away with it numbers of trout into the next pond. Whenever you are going to clean the screens drive all the trout from their vicinity, then take the screens out and wash them with a stiff brush. They may be first raked off with a rake if they are made of slats, and then taken out and cleaned. They require attention always once and sometimes twice a day.

Stocking Ponds.—The question is often asked by beginners, with what shall I commence fish-farming? Shall I buy the eggs and try to raise them, and wait three years for full-grown fish, or shall I buy adult fish, and from them take fish? The answer to this question depends upon two circumstances. First, how much money you have; and second, how long you wish to wait. It is much cheaper to buy the eggs than the adult fish; but then you will have to wait two or three years before you have any breeders. The wisest and safest plan would be to try a few thousand eggs, and also a few hundred two-year-old fish. Ten thousand eggs would cost thirty dollars, and two hundred two-year-olds would cost about forty dollars. Two hundred two-year-olds would probably give about twenty thousand eggs. If you take this advice, you will have eggs to experiment with the first year. With care, you will hatch out more or less, but in any case your experience will be invaluable to you for the next year, and you will have a stock of breeders, to furnish eggs, as you want them.

Diseases of Fry.—This part of fish-raising is least understood as yet. After the egg sac is absorbed and the fry begin to swim about, a sick one is very easily distinguished. The healthy trout swim in the current with their heads up stream, darting about here and there after minute particles of food. The diseased ones wander about listlessly, swimming round and round continually. They may also be known by the size of their heads, which appear much larger than their bodies. The head of a young trout is the largest portion of the fish, even when well, but when sick the fish appears to be all head.

Before the food sac is gone the trout is often afflicted with a swelling over the sac; a membrane forms there, swells out large and is filled with a watery substance. We call the disease "dropsy," or "blue swelling." Sometimes the trout may be saved by making an incision in the swelling and letting out the water, but as with care only a few of them are affected in this way, it is better for the fish culturist to hatch more eggs than he expects to raise than to bother with a surgery he does not understand. In other words, hatch more than you want, and keep the strongest and best.

There is a small worm which is one of the greatest enemies that the young fry have. It spins a web in the water to catch the young fish, just as a spider does on land to catch flies. The web is as perfect as that of the spider and as much mechanical ingenuity is displayed in its construction. It is made as quickly and in the same way as the spider's, by fastening the thread at different points and going back and forth until the web is finished. The threads are not strong enough to hold the young trout after the umbilical sac is absorbed, but the web will stick to the fins and get wound around the head and gills and soon kill the fish. It is even more destructive to white fish, which are much smaller than trout when first hatched. The threads spun by the worm seem to be much finer than the common spider's web, and they are not visible in the water until the sediment collects upon them. They can then be seen very plainly. The webs can not be spun where there is much current and can be easily seen in still water by a close observer. But after all the principal causes of the death of trout are, first and foremost, starvation; nine-tenths of all the young that die are literally starved. Secondly, rough handling; the least twisting or wringing of a fish with the hands will kill it. Thirdly, lack of sufficient water, and fourthly, the temperature of the water. These four difficulties, all of which are preventable, will account for the death of most of the fish that die.

Diseases and Enemies of Adult Trout.—The diseases to which adult trout are subject are numerous and often fatal. Sometimes a trout will be observed to have a white fungus growing upon it in spots. This will spread over the fish until it dies. Sometimes fish will turn to a black color. This always seems to be an indication of blindness, as we have never observed this peculiar color unless the fish was partially or totally blind. The fungus which grows upon the fish is probably not a disease, but is caused by, or is the indication of a disease. Nothing is known about remedies. If only a few trout are affected, take them out, as they will be sure to die. If the trout begin to die in numbers, change them to another pond, if possible, or give them more water. This is all we can do for them. The dead trout should be taken out of the pond as fast as they are discovered. They will rise to the surface only in very rare cases, but generally sink to the bottom, and if there is much moss in the pond they are lost to sight, and decaying on the bottom will foul the pond. If there is much sickness among the trout, we generally consider it a sign of insufficient water.

There are but few enemies of the trout in artificial ponds. If the ponds are near the house, and people constantly about them, there will be no trouble with the birds which usually prey upon fish—such as the kingfisher, fish-hawk, and crane. Even if the ponds are some distance from the house, the water will probably be too deep for the fish-hawk and kingfisher to do much mischief, as it is only in shallow water that they can be certain of their prey.

Cranes will wade into the water and take all that comes within reach of their long bills—whether frogs, snakes, or fish. But they are very few in number, and the trout are wary. If any of these birds appear, shoot them. Muskrats sometimes get into the ponds. They can not often catch the trout, but will destroy the young and the spawn if they can get at the troughs, and they eat many of the insects on which the trout feed, besides they make holes in the banks of the ponds and let the water off. A few traps will soon dispose of them. They will make a little bare path, or run on the edge of the bank, by always going in and out at the same place. Then set a trap (a common game trap, such as is sold in all country stores) in the water, so that the plate of the trap will come in the middle of the run and about half an inch under water, taking care to place the jaws of the trap in such a direction that when shut they will be in a line with the run. Then stake the chain in deep water. No bait is necessary.

Water snakes can not do any damage to the large trout, but will certainly eat all the little fish they can get hold of. Even if they do no injury, they are not of any advantage, and may as well be disposed of. Cray-fish very seldom eat the young fish. They will lie on the bottom, hidden in the mud, with the joint of the claw wide open and ready; then if any unfortunate troutling passes within reach, his doom is sealed. Cray-fish do much more mischief by their burrowing propensities. They will make holes out of the pond, or from one pond to another, through which the water escapes, and very often the young fish also. The cray-fish is the scavenger of the water, and it may be a question whether a few of them will not do as much good, by disposing of decaying animal matter, as they do harm by destroying a few fish; but they will eat spawn and the fry still encumbered with the sac. The greatest fear of all fish-raisers is that their fish will be stolen at night. A few old logs, stones, and branches of trees strewn on the bottom of the pond, will make it impossible to drag the pond with a seine. Catching them by hook and line is the only means; and if the fish are well fed daily, it will take more time to catch a mess than thieves can usually spare.

Trout also find enemies in their own kind. The only way to stop them from feeding on each other is to give them plenty of other food. It may be as well, perhaps, not to feed them on small fish, unless these are chopped up fine, for the reason that trout soon accustom themselves to certain kinds of food, and will refuse anything strange. If they get into the habit of feeding on small fish, they will not be likely to make a distinction between trout and any other fish. Certain old trout also become destructive to their brethren. Like the "rogue-elephants," and the "man-eaters," among lions and tigers, they become morose and sullen, live apart from the rest, and make war upon everything around. When you find one of this kind, spear him at once, as there is no cure, and he will invariably destroy more than he is worth. It may be worth while to mention here how one trout eats another. An old trout will catch a smaller one, in some cases one-half of its own size, by the middle, and with its strong jaws hold it fast and swim around with it, while the prisoner worries and struggles to get free. This performance lasts until the victim gets loose or is exhausted, being continued sometimes for a half a day. If the little fellow gets free, it is usually to die only a lingering death; for the breaking of the skin is fatal. When it is exhausted, the old rogue, dropping his victim, which until this time he has held by the middle, seizes it again by the head, and slowly swallows it whole; the operation sometimes taking several hours, and while in progress making the fish look as if it had no head, but only a tail at each end.

In some localities minks are very destructive. These animals are particularly to be dreaded because they do not only kill what fish they want to eat, but will take out fifty or one hundred before they stop, and having found a well stocked pond, they will resort to it again and again. The best way to trap them is as follows: "Make a box eighteen inches long by six inches broad and deep, leaving one end open, set a common game trap (such as used for catching muskrats) in the open end of the box in such a position that when the jaws are closed they will be in a line with the length of the trap. If it is set cross-ways it will be apt to throw the mink out instead of catching it. Put the bait in the further end of the box —a piece of meat or a dead fish will answer for bait—set the trap, and cover it over with a large leaf. Now, there is only one way for the mink to get at the bait, which is by working over the trap. Some trout-breeders also try to raise minks for profit, as their skins are valuable; but their habits of eating fish, and their custom of getting out of almost any box or yard in which they are confined do not make them agreeable neighbors for the trout. The fish farmer can always tell by looking at his trout in the morning whether they have been disturbed during the night. If they have been molested, whether by birds, minks, or men, they will appear excited and frightened. The water will be discolored by the mud which they stir up as they dart back and forth near the bottom, and the trout will be nearly all hidden under stones or in the moss."

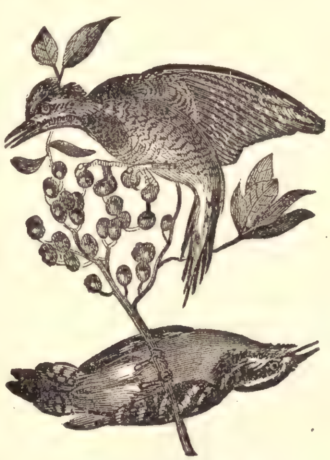
AGRICULTURAL USES OF BIRDS.

THE practical utility of birds in agriculture as agents for the destruction of various insects, is a subject but little understood or appreciated by farmers generally, yet it is one that can scarcely be overestimated. It is only within a few years, comparatively, that the value of our native birds in the economy of nature has been ascertained by leading ornithologists, and when the knowledge becomes more widely disseminated, and thoroughly understood by the masses, insect-eating birds will receive that protection from the law that their importance demands, and we shall no more see such wholesale and wanton destruction of these innocent servants of man, by the shotgun of the ignorant and thoughtless sportsman, and less destruction of the valuable products of the soil for lack of their efficient aid in keeping the various tribes of noxious insects in check.

Classification of Birds. — The classification of birds most familar to the majority of persons who have given any attention to the subject, is probably that of Illigers and Vigors, as modified from and added to that of Linnæus, the author of this classification, and consists of seven orders, as follows: Raptores, or Birds of Prey; Insessores, or Perching Birds, Scansores, or Climbers; Rasores, or Scratchers; Cursores, or Runners; Grallatores, or Waders, and the Natatores, or Swimmers.

Professor W. A. Stearns, of Amherst College, Massachusetts, says of these orders: "These

Upper Fig.—SNOW-BIRD (*Junco hyemalis*). Lower Fig.—SONG-SPARROW (*Melospiza melodia*).



WOODPECKERS.

seven orders have been in general acceptation for the last fifty years, and it is only until recently that the great advance made in ornithology has reduced the whole sub-kingdom of birds to an almost complete definition. As formerly the Raptores or Birds of Prey

were placed first, so now perfectness of structure and superiority of intelligence have caused the Carrion Crow and Robber Eagle to "step down and out," so to speak, while the well-known Robin, the head of the Thrush family, assumes the head of the tribe, and is soon followed by the more intelligent of the Insessores. As the group now stands we have the following three classes, and eleven orders:

CLASS 1ST. (*Aves Aereæ*). — Birds spending most of their time above the earth, among the branches of the trees — in the air, so to speak, comprising:

ORDER 1. Passeres, or Perchers. Order 2. Picariæ, or Woodpecker-like Birds. Order 3. Psittaci, or Parrots. Order 4. Raptores, or Birds of Prey. Order 5. Columbæ, or Pigeon-like Birds.

CLASS 2D. (*Aves Terrestres*). — Birds spending most of their time on the earth, seldom lighting or remaining on trees:

ORDER 6. Gallinæ, or Runners, Scratchers, and the like. Order 7. Grallatores, or Waders.

CLASS 3D. (*Aves Aquaticæ*). — Birds that swim in the water:

ORDER 8. Lamellirostres, Ducks, etc. Order 9. Steganopodes, Pelicans, etc. Order 10. Longipennes, Gulls, etc. Order 11. Pygopodes, Diving Birds.

The system of which these eleven orders form the basis, especially of North American Birds, — though there are very few changes to be made to have the system answer for birds everywhere throughout the world, — proves one of the most simple and most expressive of the real position held by this family in nature of any yet devised. It is only those extreme ornithologists, who strive to render difficult that which they should render easy, whose innovations we have to dread."

SPARROW-HAWK. *Tinnunculus Sparverius* (Raptores).

Relative Fertility of Birds and Insects. — In the treatment of this subject and those connected with it in relation to insect-eating birds, we are largely indebted to Mr. F. H. Palmer, of Massachusetts, from whose excellent discussion of this topic we make the following extract: "By studying the habits of birds and insects, we may easily discover the important part which each plays in the economy of nature; and history itself proves that any interference with their relations to each other is sure to be followed by disastrous results. Hence, the subject becomes of deepest importance, not alone to the agriculturist, but to every one who has a business or patriotic interest in our country. Nature, if left to herself, establishes a wholesome balance amongst her creatures; that is, she produces no more of one species than shall be kept in check by another. If there is an insect which feeds upon a certain plant, there is also a bird which destroys the insect, and an animal which devours the bird; and so on up the scale, each curbing the undue increase of the next inferior creature. It is when man interferes with the working of this law that results are sure to follow disastrous alike to his own food, health, and happiness, and that of the creatures around him. It is because he has destroyed their natural enemies that

BOBOLINK. (*Dolichronyx oryzivorus*).

insects become a pest; and they will cease to trouble him only in proportion as he shall restore the balance of which Nature shows the necessity. It is not that insects are to be destroyed or condemned as a class. Nothing is created except for the fulfillment of some good end; and the value of insects is not inferior to that of any other class of animal life; none are without their legitimate uses; and it is only when they are stimulated to excessive increase that they become troublesome. Before passing judgment upon them, we must remember that insects are, in a great many ways, very useful and valuable to man. They prepare for us the material for silk, which, in its manufacture, furnishes profitable employment to multitudes of men, women, and children, and brings in large revenues to the country. Insects we must thank for honey, — the sweetest of sweets. The air we breathe and the water we drink are kept pure and wholesome by the agency of myriads of little creatures which draw sustenance from the impurities of the elements. It is not, then, that insects are to be exterminated, even if it were possible, but only kept in check.

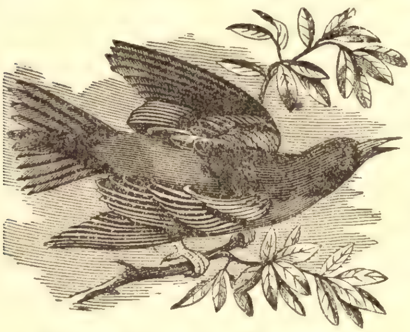
Upper fig., Wood Peewee (*Contopus virens*); lower, King Bird (*T. carolinensis*). Insessores.

The majority of our native birds have but one brood of young in the course of the year; a few have two or three. In the case of the smaller insect-eating birds, the number of eggs to a brood is, on an average, not more than five. Some of the larger birds, as the various Gallinæ, lay from five or six to twenty eggs to a brood. On the other hand, the reproductive energy of insects is truly marvelous. It is said that a single pair of grain weevils have produced six thousand young between April and August. The common varieties of aphides or plant lice, which are found on almost all kinds of plants, are produced in spring from eggs laid the season before; and through the summer only females are developed. At the last of the season, males and females both appear; and eggs are laid for the brood which hatches early in the spring. Reaumer says that one individual in one season may become the progenitor of 6,000,000,000. The silk-worm moth produces about 500 eggs, the great goat-moth about 1,000, the tiger-moth 1,600, the female wasp at least 30,000. There is a species of white ants, one of which deposits not less than sixty eggs a minute, giving 3,600 in an hour. How, then, shall this enormous mass of insects be kept in check? What shall prevent them from overrunning the country, destroying crops, and devastating the land?

Redstart (*Setophaga ruticilla*).

Food of Birds. — Various causes operate to check the undue increase of insects, and the chief of these is the appetite and instinct which a wise Providence has given to birds. If the number of eggs produced by insects is wonderful, the number destroyed by a single bird is no less so. Audubon says a woodcock will eat its own weight of insects in a single night. Dr. Bradley says

that a pair of sparrows will destroy 3,360 caterpillars in a week. We saw the parent bird visit a young purple martin on a church spire opposite our windows five times in as many minutes, and each time with an insect. A brood of partridges will nearly exterminate the denizens of an ant-hill in a couple of days. Woodpeckers are constantly employed in ridding the orchards of insects and their eggs, which they skillfully discover under the pieces of dead bark. Robbins, through the spring and summer, are continually hunting for worms and grubs, which they find concealed under the surface of the ground. We recently noticed a common chipping sparrow capture a moth, and, upon depriving her of it, we found it to be that of a common apple-tree caterpillar (*Olisiocampa Americana*), so destructive to the orchards of New England. To check the excessive increase of insects is evidently the great task which birds are intended to perform. Did they have no other office save to cheer and encourage humanity with their beautiful plumage and song, and to typify a purer and more etherial existence to us creatures who 'grovel here below,' even then they would deserve the favor of every Christian and every poet; but when the useful is combined with the beautiful, and a practical value is added to an elevating symbol, they command the interest of every one, and their protection becomes a matter of consequence to all."



BALTIMORE ORIOLE (*Icterus Baltimore*).

Mr. C. G. Maynard, of Ipswich, Mass., who in his investigations has opened the stomachs of more than three thousand birds in order to ascertain the nature of their food, mentions the following number of birds which devour the canker-worm and the larvæ of other injurious insects: Red-eyed vireo, song sparrow, chickadee, scarlet tanager, robin, black-billed cuckoo, wood peewee, least peewee, Wilson's thrush, black and white creeper, blue yellow-backed warbler, Maryland yellow-throat, Nashville warbler, golden-crowned thrush, chestnut-sided warbler, yellow warbler, black and yellow warbler, prairie warbler, black-polled warbler, Canada warbler, redstart, cedar bird, cat bird, purple finch, white-winged cross-bill, chipping sparrow, indigo bird, red-winged blackbird, cow blackbird, bobolink, Baltimore oriole. The same authority says: "Probably this list may be increased. Besides these birds, those species which occur in orchards during autumn and winter, such as the ruby-crowned wren, brown

CHUCK-WILLS WIDOW.

Upper fig., YELLOW WARBLER; lower fig., BLACK AND YELLOW WARBLER.

creeper, nuthatches, and titmice, doubtless eat largely of the eggs of canker-worms and other insects which destroy or injure the trees. Winter birds of the above species which I have shot at this time have their stomachs crammed with insects of some kind. The Baltimore oriole will eat largely of the tent caterpillar, and is the only bird which will do this. All the thrushes will eat wire worms. The swallows destroy multitudes of dipterous insects (gnats, etc). In fact, to sum the matter up, there is scarcely a bird which will not eat largely of insects at certain seasons, when these pests are most abundant. It is a noticeable fact that many species inhabiting woods and meadows leave their usual haunts and visit the fruit trees which are covered with canker-worms, and largely devour them.

In reference to the currant saw-fly worm (*Nematus ventricosus*), I am not certain that I have seen any birds eat them, yet I think the truly insectivorous species will do this. That the Baltimore oriole sometimes eats large quantities of the American tent caterpillars (*Clisiocampa Americana*), since they have been found in the stomach of this bird, is an interesting fact, for birds as a rule do not relish hairy caterpillars, and the American tent caterpillar is covered with long hairs, though they are not so dense as in some other larvæ."


BLACK-BILLED CUCKOO (*C. erythrophthalmus*). (Scansores.)

Dr. T. M. Brewer gives the following statement: "The most noticeable of all the destroyers of the canker-worm is the common cedar bird, which devours them to an extent perfectly enormous. Next is the purple grakle, which also feeds on them as long as they last. The house pigeon, if in any numbers, is an invaluable bird. Among the other birds, all excellent so far as they go, are the chipping sparrow, the song sparrow, the purple finch, all the vireos—white-eyed, red-eyed, yellow-throated, solitary, and warbling — the king bird, the cat bird, the downy woodpecker, the summer yellow bird, Maryland yellow-throat, the blue bird. The blue-jay eats their eggs in the winter; so does the chickadee. The latter eats their grubs also, and the worm too. The common gray creeper, which is with us only in the winter, eats the eggs.

"Last summer I had a nest of golden-winged woodpeckers breeding on my place. Some of them dug into my barn and passed the winter. Only a part of my trees were protected by a belt of printers' ink, and some of them were partially eaten, but this winter very few grubs have as yet shown themselves, and I give my friend *Colaptes auratus* the credit of all this. I know this, I gave the young ones a lot of worms myself, and they ate them as if they were used to them. The old birds were too shy to permit me to see their good deeds.

"I think the golden robin feeds its young with them as long as they last, but I am not sure that they eat the tent caterpillar. I nearly forgot the two cuckoos, yellow-bill and black-bill. They eat every form of caterpillar, canker worms included. I do not think the robin feeds any to its young, because it would never do; they are too small, and its brood want a big lot. I have known the robin to feed its young for entire days, as fast as they could bring them, with the moth of the cut worm. That is about as much as we could expect any bird to do at one time. At the rate they went they must have caught and given their young ones about five hundred of these moths in a day. Before that I had supposed that the robin did me more harm than good, but I had to give in. My indebtedness to that pair was worth all the cherries I could raise in many years. So the robin and I are fast friends."

Tabular View of Food for Birds.—We must conclude, then, after careful examination of the habits of birds and insects, that birds are of the greatest service to man; and that they should be protected and encouraged in every possible way. Nevertheless, it is unde-


HOUSE-WREN (*T. adon*).


YELLOW-RUMPED WARBLER (*Dendroica coronata*).

niable that this rule has some exceptions; that there are some birds which are far from beneficial, being, on the contrary, very injurious, not only to the interest of man, but also to the well-disposed members of their own race. In short, there are robbers and cut-throats among birds as well as amongst men; and it is just as sensible to pronounce the human race good for nothing because of the depravity of a portion of its members as to say that birds

are useless because a few species are inclined to wrong-doing. The following table will give an idea of the food of some of the more common birds, and will serve as a ready means of distinguishing the injurious from the beneficial species:

ORDER—*Raptores* (Robbers). *Falconidæ,* Hawks, subsist on small birds and animals, and poultry; *Strigidæ,* Owls, mice, reptiles, insects, and a few small birds.

TITMICE.

ORDER—*Scansores* (Climbers). *Cuculidæ,* Cuckoos, caterpillars and other tree-insects, and a few eggs of other birds; *Picidæ,* Woodpeckers, insects (a very beneficial family).

ORDER—*Insessores* (Perchers.) *Trocilidæ,* Humming-birds, insects; *Cypselidæ,* Swifts, all kinds of winged insects; *Caprimulgidæ,* Whippoorwills and Night-hawks, night-flying Lepidoptera (very beneficial); *Alcedinidæ,* Kingfishers, fish; *Colopteridæ,* Flycatchers, flies and other winged insects; *Turdidæ,* Thrushes, insects and a few small fruits and berries; *Saxicolidæ,* Bluebirds, insects; *Sylviidæ,* Wood-inhabiters, insects; *Paridæ,* Titmice and Nuthatches, insects and their eggs; *Certhiadæ,* Creepers, insects; *Troglodytidæ,* Wrens, insects; *Sylvicolidæ,* Warblers, insects and the seeds of weeds and grasses; *Hirundinidæ,* Swallows, all kinds of winged insects; *Bombycillidæ,* Chatterers, various insects and cherries; *Laniidæ,* Vireos and Butcher-birds, insects and small birds respectively; *Fringillidæ,* Seed-eaters, various seeds, fruits, and some insects; *Icteridæ,* Starlings, Orioles, and Blackbirds, grains and other seeds, various tree insects; *Corvidæ,* Crows and Jays, eggs and young of small birds, a few insects, corn, and other grain.

ORDER—*Rasores* (Scratchers). *Columbidæ,* Doves, berries, nuts, and seeds; *Tetraonidæ,* Grouse, various seeds, insects, and berries; *Perdicidæ,* Partridges, seeds, berries, and a few insects.

ORDER—*Grallatores* (Waders). *Ardeidæ,* Herons, fish, frogs, mice, and insects; *Charadridæ,* Plovers, Aquatic insects; *Scolopacidæ,* Snipes, worms, larvæ of insects, and grasshoppers; *Paludicolæ,* Rails, various insects and waterworms.

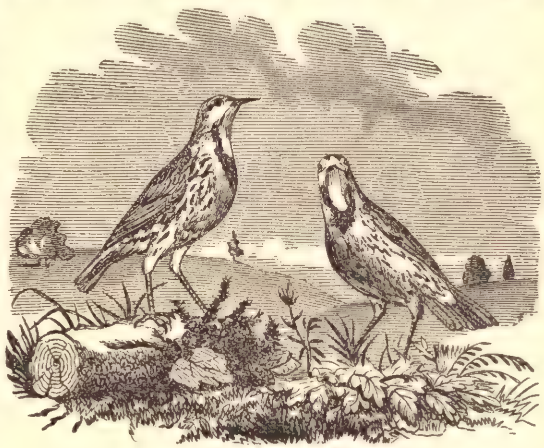
Decrease in Number of Birds.—"It is a mournful fact of history that during the past few years there has been a steady decrease in the number of our native birds in all parts of the country where man has formed his settlements. To account for this fact is easy. Man enters the forests which for hundreds of years have been the undisturbed nursery of birds. He cuts down the trees in which for centuries they have reared their young. He brings with him his gun; and, as long as there are any grouse or other game-birds in the neighborhood, the sharp report and murderous fire are his daily greeting to the wild creatures of the wood. He dams the streams, and turns them aside, and uses their power to destroy the forests on their banks. His snares are set in the valleys, and his traps on the hilltop. His children search the wood for birds' eggs and bring them home to be admired a moment as playthings, without a thought of the happy homes they have destroyed for

RED-WINGED BLACKBIRD (*Agelaius phœniceus*).

BLUE-JAY (*C. cristata*).

the sake of a moment's pleasure. In short, man has soon taught the creatures, who scarcely feared him at first, that he is a monster to be dreaded, who will give them no rest nor peace. Thus it happens that, as the centuries roll on, one species after another grows more and more scarce, or becomes altogether extinct; and in their loss the world loses more than at the death of the last representative of a long line of imperial princes.

Let us notice from history a few instances of the gradual decrease of some of our birds, that any who are doubting may be convinced. Hear what Audubon says: 'When I first removed to Kentucky, the pinnated grouse were so plenty that they were held in no higher estimation as food than the most common flesh; and no hunter of Kentucky deigned to shoot them. In those days, during the winter, the grouse would enter the farm-yard, and feed with the poultry, alight on the houses, or walk in the very streets of the villages. I recollect having caught some in a stable at Henderson where they had followed some wild turkeys. In the course of the same winter, a friend of mine, who was fond of practicing rifle-shooting, killed upward of forty in one morning, but picked up none of them, so satisfied with grouse was he as well as every member of his family. My own servants preferred the fattest flitch of bacon to their flesh, and not unfrequently laid them aside as unfit for food.' Twenty-five years after, the same author says: 'Such an account may appear strange; but in that same country where twenty-five years ago they could not have been sold for more than one cent a piece, scarcely one is now to be found. The grouse have abandoned the State of Kentucky, and removed (like the Indian) every season farther westward to escape from the murderous white man.'"



MEADOW-LARK (*Sturnella magna*).

The bird above mentioned was once probably very abundant in all the southern New England States, but is now only found in small numbers on Martha's Vineyard and one or two other islands off the southern coast of Massachusetts, being entirely extinct on the main land of New England.

Mr. J. A. Allen says: "The mammalian and bird faunæ of all the older settled parts of the United States are vastly different from what they were two hundred years ago. These changes consist mainly in the great decrease in number of all the larger species, not a few of which are already extirpated where they were formerly common. A few of the smaller species of both classes have doubtless increased in numbers. Many of our water-fowl that are now only transient visitors, — as the Canada goose, the several species of Merganser, teals, black duck, and mallard, — undoubtedly once bred in this State (Massachusetts), as did also the wild turkey and prairie hen." An old farmer of Essex County recently told us that fifteen years ago the passenger-pigeon was accustomed to breed in considerable numbers in a forest not far from his house. Now a few pairs may be seen in the spring and fall migrations; but none in the summer. In the same county, ten years ago, the ruffed grouse was quite abundant; but now it is rare that any are seen except in the deepest woods, and then only an occasional pair, most of them having been snared, and sent to the Boston market, laws to the contrary notwithstanding. Formerly some six or seven species of sea-ducks bred among the islands of Massachusetts; now none are to be found except the dusky-duck, and that in no great abundance.

WHITE-WINGED CROSSBILL (*Curvirostra leucoptera*).

AMERICAN SHRIKE (*C. borealis*).

Increase of Insects. — As a result of the decrease in the number of birds, we find that insects have been steadily increasing; and the aggregate loss through their agency is now

much greater than in former years. Since 1860, the damage done each year by such insects as the canker-worm, currant-worm, wheat-midge, Hessian-fly, etc., has been greater and greater; so that, in some sections, the cultivation of particular crops has been almost abandoned. New species of noxious insects are constantly being discovered by entomologists and others; while many species before unknown in this country have been introduced by the importation of plants, etc., from Europe. Insects that are abundant in the West are gradually working eastward, as the Colorado potato-beetle; and only earnest study and effort will prevent the continued increase of these pests of the land.

Wilson's Tern (*S. Wilsoni*).

Raven.

There are about thirty species of insects which subsist on our garden vegetables. The grape vine has about fifty insect enemies; the apple tree seventy-five; our different shade trees some over a hundred; wheat and other grains fifty. The crop of wheat in the State of Illinois was injured by insects, in one year, to the estimated amount of seventy-three millions of dollars. The estimated annual destruction of property by insects in the United States is as high as four hundred million dollars. The effect of this loss is felt not alone by the farmer. It is to this, in a large measure, that many poor men owe their poverty; to this must be attributed the high price of farm produce and all healthy food, and the consequent increase of disease and want in our large cities. We do not hesitate to say that at least one-eighth of this loss by insects might be prevented by the careful protection and encouragement of birds; or, to put it in another way, the carelessness of the people in the United States in this respect costs them at least fifty million dollars yearly, besides much unhappiness and suffering.

Mottled Screech Owl (*Scopsasis*). (Raptores.)

Hawk-Owl (*Surnia ulula*). (Raptores.)

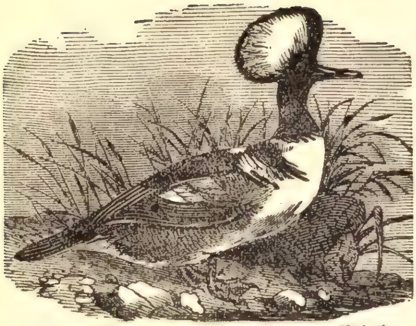
How to Protect Birds.—Of the measures for the protection of birds, perhaps the most important is the bird-law of Massachusetts (Acts of 1870, Chap. 304), which punishes by fine whoever takes or kills, sells, buys, or has in his possession, the birds named below.

Woodcock are protected between the 1st day of January and the 15th day of August; ruffed grouse (commonly called partridges), between the 12th day of January and the 1st day of October; quails between the 15th of December and 15th of October. Forfeits, twenty-five dollars for each bird above-named killed or sold out of season.

Pinnated grouse are protected till June 1st; wood or summer ducks, black ducks, and teals protected between 1st of March and 1st of September. Forfeits, twenty-five dollars for each bird killed or sold out of season.

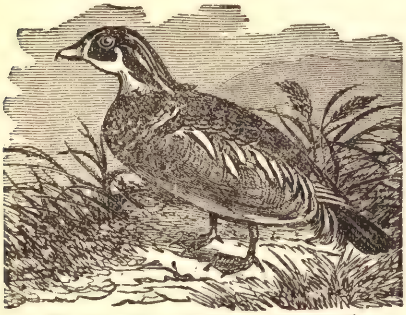
Marsh and beach birds are protected between April 1st and July 15th; exceptions, snipe and plover. Forfeits, ten dollars for each bird.

All other birds, their nests and eggs (except crow black-birds, crows, herons, bitterns,

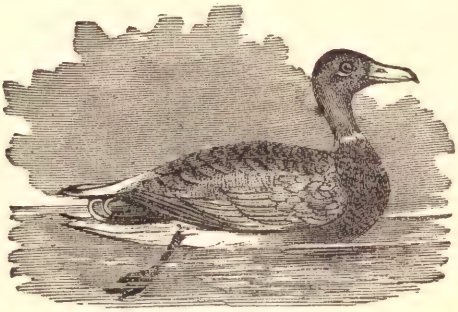


HOODED MERGANSER (*Lophodytes cucullatus*).

PTARMIGANS.

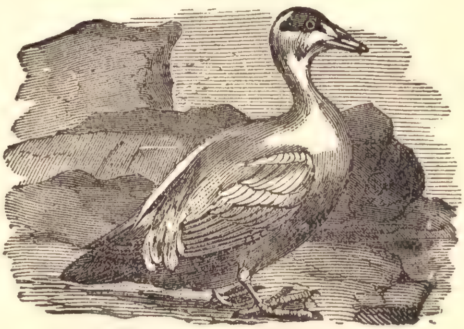


WOOD, OR SUMMER-DUCK (*Aix sponsa*).

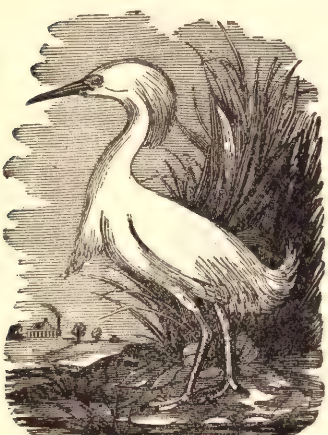


MALLARD DUCK (*Anas boschas*).

AMERICAN SWAN (*Cygnus Americanus*). (Natatores.



EIDER-DUCK (*Somateria mollissima*).



SNOWY HERON (*Garzetta candidissima.*) (Grallatores.)

WILD GOOSE (*A. canadensis*).

Canada geese, and water-fowl not previously mentioned) are protected through the year. Forfeit, ten dollars for each offence.

The State constabulary, mayor and alderman and selectmen of the several cities and towns of the Commonwealth shall cause the provisions of this law to be enforced in their respective places; and all forfeitures accruing under these sections shall be paid, one-half to the informant or prosecutor, and one-half to the city or town where the offence is committed.

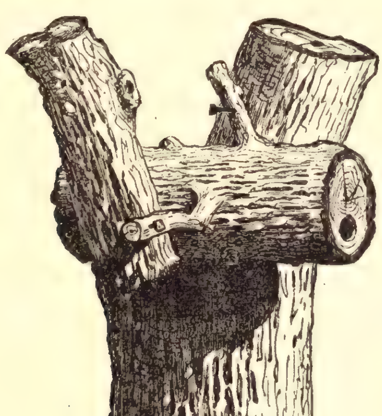
In itself, perhaps, no fault can be found with this law. It is only because it is not properly executed that it falls short of accomplishing its object. In the neighborhood of the large cities, it doubtless prevents some injury to birds: but in the small country towns we think it is very rarely that an arrest is made; and the selectmen are quite apt to look the other way to save the trouble of interfering with a neighbor or townsman. We have repeatedly seen strings of ruffed grouse, containing some dozens, which had been taken in abominable snares, being sent in to the Boston market from the small towns of Massachusetts. We believe it is still a common practice with many boys to make collections of birds' eggs, and to take not one egg only, but the whole nest, eggs and all, and shoot the parent birds, too, if possible. It is difficult to say how such things may best be prevented; but much good would be done, we are confident, if the selectmen would take the trouble to hunt up and punish a few cases which should serve as an example to others. Parents and teachers also may do much by way of precept and example, and right-minded boys may do their part by influencing their companions to abandon so cruel a practice.

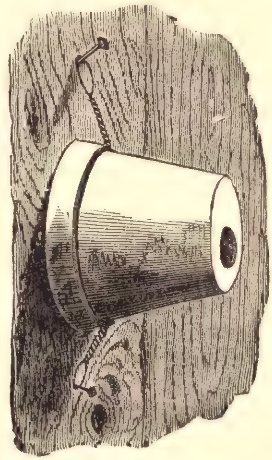
Bird Houses.—Next to the law, the most important measure for the protection of birds is the putting up of accommodations for them, and thus inducing them to settle on our estates. There is no reason why every one who has a half-acre of land should not have two or three pairs of birds nesting thereon. Perhaps many do not realize what simple accommodations swallows, bluebirds, wrens, and other birds, are eager to avail themselves of. Simple and inexpensive arrangements are just as satisfactory to them as the most elegant and costly ornamental houses; and no one need be prevented by fear of expense from furnishing dwelling-houses, rent free, to these interesting tenants. With a few simple tools and a box or two which any grocer will give you, a bird-house may be made of almost any size or shape desired. Should you wish it highly ornamental, nothing is better than to cover it with rustic-work, which may be done with the aid of a wild grape-vine cut in pieces of the right length and nailed on. Such a bird-house costs little or nothing save the time required to make it; and the slight expense will be amply repaid by the satisfaction of doing a good deed.

There are many simple contrivances which may be prepared and put up in five minutes, and will serve the birds as well as anything else. At the opening of the present season we put up four tin cans, such as are used for canning tomatoes, having first filed a small hole in the lower end to prevent the collection of water. Three of the four were immediately occupied by bluebirds. One pair laid five eggs, four of which hatched, and the young grew to maturity. The other two pairs each had two broods, four eggs to each brood, and all hatched; but three of the young died before growing up. Seventeen young bluebirds and their parents, six in number, twenty-three insect-eating birds, were thus induced to make their home in our orchard, the parent birds

for about five months, and the young, say about three months. Certainly, at a very low estimate, each bird would average twenty insects a day; for the food of these birds consists entirely of insects. At this rate the old birds would have destroyed during their stay here,

eighteen thousand insects, and the young thirty thousand six hundred, which gives a total of forty-eight thousand six hundred insects destroyed from our own and our neighbor's trees; and it did not take us half an hour to prepare and put up these simple accommodations. Are not these facts eloquent? Then how beautiful to watch the housekeeping arrangements of these beautiful little neighbors; to hear their welcome song when winter seemed still with us; to hear them debate the situation, and finally decide in favor of our apple-tree; to see





them carrying up the grasses and cotton and feathers, and weaving them together into a bed of down for the protection of their early-laid eggs; to watch their love-making, and all their gentle, affectionate ways towards each other; their jealousy of intruders, and their solicitous

care of their eggs during the period of incubation; their final joy when the young break the shells, and are born to the light; and their untiring devotion in obtaining choice bits of insect-food for the nourishment of their offspring. Truly here is beauty at our door-yard, and poetry has taken up her abode in our apple-tree. Purple martins and other members of the swallow tribe will readily occupy boxes put up for their use. Wrens, too, are interesting friends, and are easily induced to settle with us. We know of a case where a pair of bluebirds found a happy home in an old beaver hat which had blown up and lodged in an apple-tree. A good bird-house may be made of a medium-sized flower-plot, with the hole somewhat enlarged, and the top covered with a board. Will not every one who has a dozen rods of land make a bird-house of some kind, and thus help restore the proportions of the feathered and insect races ?

We of the United States are considerably behind European nations in caring for and protecting insect-eating birds, and providing places for them to build their nests about our dwellings and gardens. The Swiss and French may perhaps be said to stand first as regards the protection of the smaller insect-eating species of birds, while the English, Scandinavians, and Germans are not far behind them in this respect. The myriads of ravaging insects with which the farmer has to contend in securing a crop in this country, show conclusively how little protection these ever-active little insect-gleaners have received from us in the past, and what may be anticipated in the future, unless better protection is given them from cruel and wanton destruction.

PART VIII.

A HIGHER STANDARD FOR THE FARMER.

BUSINESS PRINCIPLES.—Since all mankind depend for their sustenance, either directly or indirectly, upon the products of the soil, it follows, as a natural consequence, that a large proportion of the human race must ever be engaged in the pursuit of agriculture; and since the producers must not only provide for the wants of their own families, but for the non-producing population also, it will be found that the former will generally exceed the latter in numbers among any nation. This is especially true in our own country, where farming is the leading pursuit; yet, notwithstanding its great importance, when compared with other occupations, there is probably no kind of business practiced where so little system of keeping accurate accounts of debits and credits is followed as in that of the farmer. In fact, we doubt whether, if an accurate report were made, there would be found more than one farmer in ten who conducts the affairs of his farm on strictly business principles. As a result, for the most part, in agricultural economy as thus conducted, there are no definite means of knowing which crops are most remunerative, or which are at all profitable for raising, and instead of reliable data there is nothing except mere guess-work or approximate estimate. The excuse generally made by farmers for this lack of system is that keeping accurate accounts of debits and credits involves an expenditure of too much time and labor, or that it is but of little importance, and does not pay for the trouble. Now, what would be the result should the merchant, the manufacturer, or the banker conduct his business in the same manner? It is quite as important to the farmer to know the financial state of his affairs at all times, and the total amount of his receipts and expenditures for the year, as for a man engaged in any other employment, and he can no more afford to lose the benefit thus to be derived than can a merchant, manufacturer, or person engaged in any other occupation.

No business man whatever can carry on his trade or profession successfully, and have an intelligent knowledge of its condition, without keeping books and a careful posting of them in order to know the real condition of his affairs, and enable him to correct any errors in his mode of procedure; and this is the only way in which the farmer can have at all times a correct knowledge of his business. If no accounts whatever are kept of receipts and expenditures, the farmer will not be able to tell whether he is making or losing money, which are the most profitable crops, or what is the total amount of his possessions; without such an account, also, many losses may be sustained which might otherwise have been prevented. Besides, a record of dates, prices, etc., is a great convenience for reference, and many debts, loans, and charges that might otherwise be forgotten are more promptly attended to, and the farmer who is the most accurate in this respect is the most liable to be prompt in all his business arrangements, as well as more likely to keep out of debt. Book-keeping may be made very simple, and the small amount of time and labor required to keep the books in order may be taken in the evening after the work for the day is over, or at some other time from less important work. In order to keep an accurate account, all business matters should be taken note of immediately at the time of transaction. This may be done by means of a memorandum book or diary carried in the pocket, and a record copied in the day-book in the evening, each day's account thus being kept up to date. The books necessary for keeping farm accounts are a diary or journal, day-book, and ledger, or, as is sometimes done, the last part of the day-book may be used for a ledger; but it would be found much more convenient to have two separate books for this purpose.

The Diary.—In this book, which for farm use is generally of convenient size to be carried in the pocket, a record of each day's transactions should be made, including the labor performed, things purchased or sold, or other business, and all items of importance that it is

desirable to remember, with prices, dates, etc.; the records here to be sufficiently full to become, in a measure, a reference book from which the memory may be refreshed with regard to the principal data of the farm and household. It should be, in fact, the history of the work of the farm and the business life of the farmer. Making a note of the weather each day, and such items of interest as the receiving of friends by the family, or the leaving home of any member of the household, will also make it frequently valuable for reference.

Day-Book. — In this should be recorded each day, with dates and prices, everything spent for the benefit of the farm, which should be charged to it as debtor to that amount; while everything sold from the farm, being produced by it, should be credited to it. This book, for the average farmer, should contain from 250 to 300 pages, the pages to be ruled on the left in order to record the number of the page of the ledger to which the account is transferred; also two double columns on the right for dollars and cents. The usual method is to keep the debit account on the left hand page, and the credit account on the opposite (right hand) page. In this manner an accurate account may be kept with different fields or animals, if desired, as well as with individuals and farms. A field, for instance, would be debtor (Dr.) to the use of the land, the expense of the manure, tillage, seed, cultivation, harvesting, preparing for market, and marketing, or delivery at the place desired; and creditor (Cr.) by the amount of money received for that portion of the crop sold and the value of that which is used on the farm or in the household. A cow would be Dr. to her original cost, the interest on the money invested, and the expense of her keeping, and Cr. by the value of her milk and calves; a sheep Dr. to first cost, and interest on the money invested, and keeping, and Cr. by the lambs and wool, manure furnished, etc. When either page is filled, both should be added, and the different amounts placed at the bottom, when new charges and credits should be commenced on the next two pages.

The more accurate such accounts can be made, the more definitely will the figures, on balancing the account, show the real condition of the business. An able authority on the subject of keeping farm accounts says: "Sometimes we see accounts, even in agricultural reports, in which everything a farmer raises is set down at the market value. For instance, credit is given for the number of tons of hay, the number of bushels of corn and potatoes, and everything that is raised, without a corresponding debit of what is used in keeping the stock through the year — making it appear as if the net income was very large, when, in reality, nearly all is used upon the place. A farmer may, perhaps, plow large fields that have been previously manured, and, without applying any fertilizer, obtain a good crop, which, when sold, brings in a large sum of money. He may decide that his profits are large; but a system of book-keeping that estimates the value of the land of each field, each year, would oblige him to appraise the fields from which his large crops were taken as of less value than before. This would show him that the profits were not really as large as he at first supposed. Another might spend a good deal of time and money in making improvements, which, for the present, bring in no profit, and it might seem that nothing was made by farming; yet an account of what his improvements cost, and of all that the land (on which the improvements were made) produced for several years, would change his mind. Thus, by carrying out a system of book-keeping which not only applies to the farm as a whole, but also to each operation in detail, a very large fund of practical knowledge would be obtained in a few years. If each farmer in our nation would thus estimate the expenses of his business, our practical knowledge of the value of agricultural products would be increased, and the amount of productions in the country be vastly enlarged."

Ledger. — Whatever system of keeping accounts is followed in the day-book, a ledger should be kept, since it will be a great convenience in representing at a glance the real status of the business, the results of the transactions recorded in the day-book being transferred to its pages. Thus are brought together in a compact form all the transactions which may be had with a single individual, being collected from the various pages of the day-book — perhaps representing several months of time — and arranged in a systematic manner. The ledger should be so ruled that the Dr. and Cr. accounts with a person can be kept on a single page, the Dr. occupying the left hand side and the credit the right, thus showing at a glance the state of the business affairs; thus, if we transact business with A, and the Dr. side of the ledger exceeds the Cr., showing that A owes us more than we trust him, the balance is so much in *our* favor; but if it shows that the Cr. side exceeds the Dr., then we owe him more than he trusts us, and the balance is in *his* favor.

Every six or twelve months all the accounts in the ledger should be balanced by adding

all the Dr. and Cr. columns, and subtracting the smaller amount from the greater, and employing the remainder as the beginning of a new account. The ledger should have an index at the commencement, with the pages containing the transactions with different individuals plainly numbered. An inventory should be taken by the farmer of his property once each year, including land, buildings, live stock, farm produce on hand, agricultural implements, cash on hand, dues, or unsettled accounts; in fact, every thing of money value which he possesses. In doing this, the different kinds of property should be specified, together with the money value of each. This should be done at the beginning of the year or first of April. He should also find the amount of his liabilities, which will include all borrowed money and debts of every kind, and such a proportion of his taxes, interest, and insurance as may be due at the time of making the inventory. If the inventory exceeds the liabilities, the difference between the two sums shows how much the man is really worth; but if the liabilities exceed the inventory, the difference indicates how much the individual is in debt, or the excess of his liabilities beyond his means. Thus a comparison of such accounts year by year, or oftener if desired, will show the farmer whether he is making or losing money, and the precise amount, as well as the present value of his possessions.

Insurance. — Since all persons are liable to calamities of one kind or another, either to themselves physically by accident or by loss of their property by fire, it may be well for every farmer to consider the benefits to be derived from the partial remedy which insurance affords for such ills. Although insurance cannot extend the life of an individual, or prevent accident or calamity to himself and property, yet it affords, to a certain extent, either to the person insured or to his family, protection against some of the evils resulting from such events. The three principal forms of insurance in which the farmer might find especial interest are life, fire, and accident insurance. Life insurance, when secured with a reliable and trustworthy company, is a safe and easy method of providing for the family or friends of the person insured in case of his death.

In life insurance the managers of the insurance company take their risk of paying the policies of those they insure in case of their death, knowing that according to the usual mortuary records some of their members must die each year. Those of the policy-holders that live can make the requisite payments without much sacrifice, which payments go in part to pay the policies of those that die, and thus aid the families of the latter. When a policy-holder dies his family receives from the insurance company the sum for which his life was insured. In many years the policy-holder pays a considerable amount for his insurance, but rarely as much as his policy will amount to when he dies.

Fire insurance covers the risk of the destruction of buildings, furniture, and clothing from fire. While taking this risk the insurance company granting the policy requires that certain precautions shall be taken against fire, and unless the precautions or rules are observed the policy is annulled. In order that the owner of property insured shall not be tempted to destroy it by fire, insurance companies never insure for the full value, but generally from one-half to three-fourths of the real value of the property, and will pay all just and honest claims embraced in their various contracts.

Accident insurance is based upon about the same principle as life insurance, the expense of the policy being proportioned to the risk to which the person is exposed. The expense of a policy of this kind is generally less than either life or fire insurance, and it secures to the individual holding it a stated weekly allowance during the period of entire disability from accident, if the time does not exceed six months, or the payment of a certain sum to his family, providing the injury proves fatal. We are well aware that during the past few years many insurance companies have proved themselves unworthy the confidence of the public, much to the loss and disappointment of their patrons, but we must remember that these, when compared with those that are reliable and trustworthy, are very few in number, and the fact of there being any such does not argue at all against insurance or the principles upon which it is founded. The coins of purest gold may be counterfeited, but this does not prove that there is no pure gold. Before obtaining a policy of insurance of any kind, or of any company, however, it would always be best to obtain all the reliable information concerning its trustworthiness possible.

False Economy.—While true economy should be practiced by all, and ever brings its own sure reward, many grave errors are committed, and worse than needless sacrifices are constantly being made in its name. Without economy one of the principal elements of success in life is wanting; while with it, other conditions being equal, a person is almost sure

to succeed. True economy has been defined as using things to the best advantage, while false economy is the reverse, and is but another name for penuriousness and mismanagement in some of its forms, of which there are many. The farmer who thinks he cannot afford to purchase books and take papers which are especially designed to assist him in his occupation, or who continues to use hand power in his work where the machine could be much more profitably employed, is practicing false economy to the detriment of his business and himself individually. In all kinds of business "knowledge is power," and he who possesses it has one of the great elements of success; yet how shall he possess knowledge without obtaining it in a great measure from the experience and investigations of others. To be sure, one may experiment for himself in a small way, and may derive much benefit by this method, but his own experience must of necessity be limited, requiring time; and how much greater advantage would be derived, if in connection with his own researches he should be able to command the use of the knowledge derived from the investigations of those who have made a specialty of such subjects. What would be thought of the mariner who should attempt to cross the ocean without a compass because he thought he could not afford to purchase one, or a lawyer or physician who attempted to practice their respective professions without the aid of books giving instruction on the topics pertaining to them?

Other methods of practicing false economy might be embraced in the keeping of inferior breeds of stock, or if the herds are such as are desirable, keeping them in a poor condition; the purchase and use of inferior tools, allowing the farm-buildings to become dilapidated, without making the necessary repairs; letting things run to waste generally for lack of time or funds to attend to them; buying necessary things for use on the farm and in the family in small quantities, thus losing the advantage to be derived from the commission off to be saved when making a purchase of a considerable quantity, besides the convenience of having things constantly on hand; buying goods on credit instead of for cash; growing unsuitable crops; buying things which might easily be grown at home; borrowing tools; hiring tools mended when they could be mended at home just as well, and at no expense; keeping the children home from school to work and allowing them to grow up in ignorance when they should be acquiring an education to fit them for future usefulness, all of which are too frequently seen and practiced under the mistaken impression that by so doing the best interests of economy are thus subserved.

Education.—The advantages to be derived from a good education can scarcely be overestimated, and a cultivated mind is just as beneficial to the farmer as to persons engaged in any other pursuit. It is frequently the case that the boys from farmers' families who are intending to follow some professional or mercantile business are allowed special educational advantages, but those that follow the profession of farming (for farming is one of the noblest and most honorable of professions) are permitted to have but limited privileges in this respect. Education is a power in any department in life, and it is quite as essential that the farmer should be able to utilize this power in order to attain the highest success in his calling as the lawyer, the physician, or the merchant; and the better his education, together with the ability to appropriate this power to its best uses, the more successful the farmer, as a general principle. Professor H. E. Alvord says in this connection: "The farmer must apply to himself, and to the son or sons to succeed him, a standard similar to that by which he measures the qualifications of his doctor and his minister. It is unfortunate that farmers are so slow in doing this. No one ever heard of a physician fresh from his schools and books being sneered at as a 'book-doctor.' On the contrary, all doctors without a complement of book-learning, scientific training, are shunned and denominated 'quacks.' Yet very recently it was common for farmers of the olden style to look with pity, if not suspicion, upon those who studied agriculture as a science and undertook its practice with a progressive spirit, and to call such 'book-farmers.' Happily such errors are passing away; book-farmers, well educated farmers, are making themselves felt; winning respect and finding an appreciation of their enterprise. Let us hope the time is not distant when book-farmers, in the best sense, shall be in the majority. Then, perhaps, 'quacks' will be found in farming. The fact is, at present quack-farmers are too plenty and book-farmers too few.

Book-farming, in its truest sense, is only making use, in addition to one's own experience, of the experience of others, as recorded by them on the printed page. And these others are often men who have been able to give much more time to the study and practice of special branches of agriculture than it will ever be possible for us to do. If the books be only on subjects where we need light, and their authors known as competent to give it, the more we have within reach, and the more we study them, the greater becomes our store of

experience of that experimental knowledge which, whether of our own obtaining or procured from others, is so necessary in guiding our footsteps every day we live.

In every farmer's home there should be good books on the various branches of scientific and practical agriculture, which give us the benefit of established facts; and good periodical journals and newspapers should be coming in to bring the latest intelligence and experience in all farming operations. More important still, a *taste* for this class of useful reading should be cultivated by the farmer himself and formed in his family by precept and example, to the exclusion of the raft of stuff which goes under the name of literature, but which serves only to assist in wasting precious hours.

A demand has arisen, and is increasing, for a higher education for farmers, and the next question is, of what shall it consist? When one comes to consider or describe a comprehensive agricultural education a big subject is presented. Agriculture is at once a science and an art. 'Practice with science' is, therefore, a good precept for its student, and it is well to keep fresh Davy's excellent definition of science as 'refined common sense." The educated farmer must be able to keep pace with the advance of modern science and discern wherein its developments may be brought to his aid. He should be a better chemist than his doctor or his druggist, a better botanist than either, and should be acquainted with geology. mineralogy, entomology, and somewhat with meteorology. He should be as good a business man as his grocer or his banker; especially he must know how to buy and to sell. He must understand the physical powers, know the value and strength of materials, and be a pretty good mechanic, if not an engineer. He should be able to do plane surveying and leveling and to manage a microscope. A farmer needs as accurate knowledge of anatomy and physiology as a physician, though it be in a different and wider field; he needs to be something of a lawyer, to know what trees he may cut, and when he may shoot a woodchuck or take a trout on his own farm,—and he needs a fair share of his minister's theology and faith to fully appreciate the mysteries and the beauties of creation, the grandeur of nature and natural laws, and to truly love and honor the vocation which, above all others, brings man into close communion with God. In short, it is safe to assert that no human occupation requires so long a course and wide a range of study to fit a person comprehensively for its intelligent and profitable pursuit as agriculture. There is, besides, the necessity of practice, or the apprenticeship part of learning the art.

This presentation of the subject should not discourage nor alarm. There are partial courses and short cuts to successful special farming as well as to the bar and the pulpit. A half loaf is better than no bread, and in some cases does as well as a whole one. We are not considering the training needed to make a plowman, or a teamster, a mower, or milker, or ditcher, but the making of a farmer, in the broadest sense. Education requiring time and money, and ambition and brains, solid, substantial study and drill, will be meat and bread to the farmers of the next century, and of these many are now alive.

If the question anywhere arises which of three boys on a farm shall be given the advantages of a collegiate or technical education, the one who is to be a professional man, the one who is to go into business, or the one who is to be a farmer, there is no sort of question in my mind that the future farmer is the one who needs special education the most, and a good agricultural school or college is the place to get most of it."

When we compare the old methods of agriculture practiced by past generations, and the results obtained, with those of the most enlightened and scientific farmers of the present time, we can more fully realize that the old were based upon ignorance, and to some extent superstition, and the new upon science and practical knowledge; and he who adheres to the old and ignores the new, must expect to be left in the rear, as far as progress and successful results are concerned. The farmer should have a special knowledge of his business, embracing an understanding of the nature of different soils, the agricultural value of different manures and fertilizers, and their adaptation to different soils and crops; the best methods of tillage and cultivation adapted to different soils and plants; the principles of breeding, care, and general management of farm animals, together with a thorough understanding of all the various other departments of agriculture, of which there are but few. Besides this, the farmer should possess a good fund of general information, and not be narrowed and limited to merely his business, however extensive or small it may be, for narrow-mindedness is to be deplored in any one, and a person of but "one idea", however good that idea may be, is as unpleasant to meet in the rural circle as any where else; besides, such an individual has not that capacity for usefulness and enjoyment in life, as one who is well informed on general subjects, and such information as is derived from the reading of the best books and newspapers, attending Agricultural societies, lectures, farmer's clubs, access to public libraries, attending and partici-

pating in the debates of lyceums, where the topics of interest on general or special subjects are discussed, etc., all of which are highly educating in their influence, and in very many instances have been made to well supply the deficiency of educational advantages in the earlier life of individuals.

Form of Constitution Suitable for a Literary or Debating Society.—The following form of a Constitution and By-laws, adapted to a literary or debating society, and copied from the records of a society of this kind, may be found convenient as a model or guide in general outline, in the formation of such societies. Of course, this form is not intended as a model to be *implicitly* followed, but as a form to be modified or deviated from to suit the circumstances.

CONSTITUTION,

OF THE ——— SOCIETY OF ——— (name of city or town, and State.)

PREAMBLE.

We, the undersigned, do declare ourselves an Association for mutual improvement in Elocution, Composition, and Debate, and for enlarging our fund of general intelligence : in the pursuit of which objects we desire to exhibit a due consideration for the opinions and feelings of others, to maintain a perfect command of temper in all our intercourse, to seek for truth in all our exercises—and have adopted for our government the following *Constitution.*

CONSTITUTION.

ARTICLE I.—NAME.

This Association shall be known by the name of the ——— SOCIETY.

ARTICLE II.—OFFICERS.

The Officers of the Association shall consist of a President, a Vice-President, Recording Secretary, Corresponding Secretary, and Treasurer, who shall constitute a Board of Directors; also two Tellers and an Editor.

ARTICLE III.—OFFICERS' DUTIES.

Section 1. It shall be the duty of the President to preside at all meetings of the Society, to enforce a due observance of the Constitution, By-Laws, and Rules of Order; to decide all questions of order, offer for consideration all motions regularly made, apportion duties two weeks in advance, call special meetings, appoint all committees not otherwise provided for, and perform such other duties as his office may require. He shall make no motion or amendment, nor vote on any question or motion, unless the Society be equally divided, when he shall give the casting vote.

Sec. 2. In the absence of the President, the Vice-President shall perform the duties of that officer, and shall be Chairman of the Board of Directors.

Sec. 3. The Recording Secretary shall keep in a book, provided for the purpose, a record of the proceedings of the Society; also a record of the name and residence of each member, showing when he was admitted, and when he died, resigned, or was expelled; keep a record of the subjects debated, the disputants, and the decisions of the Society in a separate book, and shall have charge of all books, documents, and papers belonging to the Society.

Sec. 4. The Corresponding Secretary shall notify absent members of their duties for the two succeeding meetings, also each person elected a member, of such election, and shall write all communications.

Sec. 5. The Treasurer shall receive all moneys belonging to the Society; keep an account of all dues and fines, and of all receipts and expenditures; notify each member monthly of his dues and fines, and collect the same; and shall call the Roll at the opening and close of each meeting. He shall report the state of the Treasury whenever required by a resolution of the Society, and shall make no payments without a written order from the President, and countersigned by the Recording Secretary.

Sec. 6. The Editor shall copy, and arrange in a collected form, all communications received by him, excluding such as may be deemed by him unpleasant personalities, or otherwise unsuited to the time and place, and shall read the same at every alternate meeting of the Society. He shall maintain secresy concerning the authorship of all communications, and insert them without addition or alteration. Such periodical shall be called the ———.

Sec. 7. The Tellers shall canvass the votes cast at all elections; shall immediately make known the result of same, and render a true written report at the meeting following such election.

Sec. 8. The Board of Directors shall be a Standing Committee to manage the affairs of the Society, holding meetings at least once a month. They shall decide upon all questions of debate offered in the Society, and shall examine and inquire into the standing of all persons proposed for membership, and at the next regular meeting report the result to the Society, who shall determine upon their admission.

Sec. 9. The Board of Directors and Treasurer shall present to, and read before the Society, reports at the expiration of their terms of office.

Article IV.—Election of Officers.

Section 1. All Elections for Officers shall be held at the last regular meetings in June and January. The term of each shall commence at the meeting following his election. In case of a vacancy occurring in any office, the Society shall go into an immediate election to fill the same, and the officer elect shall take his seat immediately after such election.

Sec. 2. All elections for officers shall be made by ballot, and shall be determined by two thirds of the votes cast.

Article V.—Membership.

Section 1. Any member may propose a person for membership at a regular meeting, by giving his name, residence, and occupation, and after being reported upon by the Board of Directors, the Society shall determine his admission by a three-fourths vote of the members present.

Sec. 2. Any person may be elected an Honorary Member of the Society, by a unanimous vote at a regular meeting. He shall be entitled to all the privileges of a member, except holding office, or voting upon any question or motion, and shall not be fined for absence, nor called upon for the initiation fee or dues.

Article VI.—Amendments to Constitution, etc.

Every proposed alteration, amendment, or addition to this Constitution, By-Laws, and Rules of Order hereunto annexed, must be handed to the President in writing, who shall publish the same to the Society, and at the next regular meeting, it shall be adopted by a two-third vote of the members present.

Article VII.—Order of Business.

A motion to change the Order of Business, or to postpone the performance of the regular duties, shall require, for its adoption, a vote of two-thirds of the members present.

Article VIII.—Suspension of By-Laws.

A By-Law or Rule of Order may be suspended in case of an emergency, by a two-third vote of the members present, but only for a single evening.

Social Life in the Country.—The meagreness in social and intellectual influences, as compared with most occupations, that is commonly found in farming districts, is one of the grave objections made against farming as an occupation. The pursuit itself, as commonly carried on, does not bring the farmer in contact with other minds, as does that of the merchant, the lawyer, the physician, the mechanic, etc., a contact which has a tendency to develop the social element in a man's character. In most farmers' houses there is a comparative isolation of each household, which becomes to a certain extent a little society or world of its own, while the farm-house with its surrounding out-buildings stands conspicuous in its independence, and may be compared to a feudal castle in the midst of its dependent cottages, giving a peculiar charm to country scenes. Farmers and their families are also so busily occupied, that they seem to find little time for social recreation;

they work too hard, read too little, think too little, and do not spend sufficient time in social culture; consequently they make life a drudgery, and its object the gaining of dollars and cents, while their intellectual culture is in many cases sadly neglected. Going so seldom into society, it happens in many instances that they finally come to have an aversion to it, and feel awkward and out of place when in the society of well educated and refined people. Now there is no reason for this; the fault is in the *farmer himself*, and not in his business; his occupation, if rightly considered, does not debar him or his family from intellectual enjoyment, or the advantages of the refining influences of social life; it is self-imposed, and in time becomes a habit so confirmed that it seems difficult to break, and soon becomes to be regarded as a necessity. The farmer's occupation is one that is ennobling and elevating, and there is no reason whatever why those who till the soil or have the management of farm animals should not experience the refinements which are the result of mental culture, and formal social life, or should not feel perfectly self-poised and at ease in the parlors or assemblages of the most refined and cultivated people in the world. If the farmer would take advantage of the facilities afforded by advanced agriculture, and keep abreast with the age in which he lives, employing the best implements in the performance of his labor, the most approved methods of practice, together with all the aids to be derived from the reading of the best books and papers on agricultural topics, there would be a great saving of physical strength and time, and larger profits, thus affording more opportunity for cultivating the mind and enjoying the influences of refined social life. It does a farmer good to doff his business bargains in the pursuit of dollars and cents, his farm talk of crops and cattle, with his working garb, and in his best attire mingle with a motley company of his neighbors,—men, women, young men, and maidens, for a pleasant recreation.

Such contact with other minds has a refining influence, it rounds off the sharp corners and idiosyncrasies of an individual's character, polishes off the rough surfaces, and makes him feel better satisfied with himself and the world around him, while he thus naturally falls into the ways of an intuitive kindness, which is, in fact, the truest politeness, the doing to others as he would that they should do to him; thus a more genial and refined manner is unconsciously developed. If a person is naturally morose, pleasant, refining society is one of the best means of dissipating that tendency. In attempting to please and entertain others, one is himself pleased and entertained, and after an evening spent in pleasant social converse retires with many of the rough asperities of his nature considerably toned down. This influence remains for a few days, and would be permanent, if it could be occasionally re-enforced by such participations, the result being most agreeable and useful. A person can be more useful to the world and to himself, be a better and happier man, for enjoying the refining influences of social life. If farmers generally would work less, and spend more time in improving their intellectual and social faculties, they would live longer, be more useful and happy, and more successful in their business. A knowledge of the common courtesies observed in the best society is a great benefit to every one, young or old, and has a tendency to make a person feel self-poised and at ease under all circumstances, besides making one appear at better advantage in society, since it relieves from all embarrassment and awkwardness.

Such information can only be obtained from reading and coming in contact with cultivated and refined people. Farmers should be interested in all that pertains to public improvements, and the social elevation of the town in which they reside. Ignoring these things, and they ignore the best interests of themselves and families. Every country town ought to have a public library of choice reading. Even though small in the number of its books and periodicals, let them be wisely selected, and the number can be generally enlarged every year. Such an institution, properly managed, has a wonderfully educating and refining influence upon a community. Stated social gatherings, literary societies, lyceums, with perhaps an occasional lecture, are also educating in their influence, and this is an admirable way of spending one or two evenings of the week in winter, or at other times when the season is such as will admit.

Character.—The term character and reputation are very apt to be confounded. Character might very properly be defined as *what the man really is;* and reputation, as *what others say he is;* hence, a person's reputation is not always (although generally) an index of his true character. For instance, a person may be maliciously misrepresented, misunderstood, or through lack of appreciation in others, not enjoy that good reputation which his character merits; while on the other hand, his qualities may be so over-estimated, and such a false value set upon them, that he may have a far better reputation than his true character, if

known, would warrant. Only an individual's own actions can affect his character; it is what the man *really is* that enstamps that, and not what men *say* he is. It should be the aim of every one to establish a good reputation, for no one should be indifferent to public opinion, yet the desire of possessing a good reputation should never conflict with our ideas of right, our moral principle, and cause us to sacrifice the latter to obtain the former. Conscience and duty to God and man should be the standard of guidance in life, rather than public opinion. Whoever pursues such a course quietly and persistently will generally be appreciated and respected among his fellow-men; but if not, he will have the satisfaction of an approving conscience in doing right as far as he understands his duty.

A truly noble nature will generally be recognized as such by those of a similar character; and eventually, if not speedily, will the sincere endeavor to do right be fully recognized and appreciated in every one. In order to secure a good reputation, a person must be honest in intent and deed. "Honesty" will ever be found "the best policy" in every department in life, yet the truly honest course should be followed because it is *right*, and not from motives of policy, or for the hope of the reward it may bring. The farmer who always furnishes a good article to the market, and never practices the many petty devices frequently resorted to for making products appear to be of better quality or of larger quantity than they really are, will soon establish a reputation for honesty and fair dealing that will be a great aid in securing good prices and custom for his products. The financial advantage to be derived from strictly fair dealing, and a good reputation, may, however, be regarded as incidental, and are not to be considered at all in the light of a motive. Deceit and trickery may prove successful for a time, but eventually they will be detected, and will result in failure of success in the end. A strictly honest man will be honest in every department in life, and his character be free from all stain. An immoral man cannot be justly regarded as an honest man, and should never be trusted as such in business transactions, for if he would prove false and recreant to the most sacred relations in life, and by his influence, debase rather than elevate humanity, he is not to be safely trusted in minor matters involving financial interests; while he whose life is guided by strictly moral principle, and what is better, Christian principle as well, will be universally respected and trusted when his true character is known, and has in his possession one of the highest elements of success.

Penuriousness and Extravagance. — It has become somewhat proverbial that penuriousness is the common fault of farmers. Whether this may be true in a general sense, it is certainly a fact, that too many farmers carry what they regard as a necessary economy to excess, and which in the farmer himself, his wife, and his children, amounts almost to the sacrifice of martyrdom, every dollar and cent that can be saved from the bare necessities of maintaining an existence being hoarded up and put in the savings bank, government bonds, or expended in the purchase of new land, while every waking hour is spent in the hardest kind of drudgery in order to eke out, if possible, a few more dollars to add to the hoarded treasure. In such a household we see none of the pleasant adornments that add so much to the beauty and attractiveness of the home; there are few, if any, books and papers; only the bare necessary articles of food are found upon the table, while the furnishings of the house and the clothing of the inmates are of the most meagre character, all the common comforts and enjoyments of the home being sacrificed for the purpose of laying up a few more dollars. It is no wonder that children leave such a home as soon as they are old enough, and do not remember it in after life with pleasure. Such penuriousness will be found the poorest economy in the end.

The opposite extreme will be found in extravagance and wastefulness, which are sometimes very improperly regarded as liberality and true generosity, both of which extremes should be equally avoided. True economy may not be incompatible with the gratification of necessary and specific wants, but the spending of money for unnecessary things which we may want, but cannot afford to purchase, is extravagance.

Temperance. — In the economy of life, the temperate use of things is the safest, and, therefore, the wisest method of procedure. The practice of drinking spirituous liquors as a beverage is a *great evil*, — one of the greatest with which our country, as well as the other nations of the world, are cursed, and if young men realized as they should the fatal snare into which they enter when they commence forming this habit, they would shrink from it with abhorrence. We believe in the use of alcoholic liquors as a medicine when no equivalent can be found to answer the purpose, but that they should be used sparingly and only when necessary, the same as all medicinal drugs. Even a moderate use of liquors is injurious, not only because

it will almost inevitably lead to excess, it being difficult for most persons to draw the line between a moderate and immoderate use of it, but from its evil effects directly upon the whole system, especially upon the nerves and heart. Dr. N. B. Richardson, one of the most celebrated physicians of London, states that he was able to convey a considerable amount of conviction to a man who thought he could not get along without his regular daily rations of alcoholic stimulants. He did this by showing him the effects of alcoholic liquors upon the action of the heart.

He says: "I said to the man, will you please feel my pulse, as I stand here, counting it carefully. What does it say? He did so, and replied, 'Your pulse says 74.' I then sat down in a chair and asked him to count it again. He did so, and said, 'Your pulse has gone down to 70.' I then laid down on the lounge and said, will you take it again? He replied, 'Why, it is only 64; what an extraordinary thing!' I then said, when you lie down at night, that is the way nature gives your heart rest. You know nothing about it, but that beating organ is resting to that extent; and if you reckon it up, it is a great deal of rest, because in lying down the heart is doing ten strokes less a minute. Multiply this by 60, and it is 600; multiply it by eight hours, and within a fraction it is 5,000 strokes different; and as the heart is throwing six ounces of blood at every stroke, it makes a difference of 30,000 ounces of lifting during the night. When I lie down at night without any alcohol, that is the rest my heart gets. But when you take your wine or other alcoholic drinks, you do not allow that rest, for the influence of alcohol is to increase the number of strokes, and instead of getting this rest, you put on something like 15,000 extra strokes, and the result is, you rise up very nervous and unfit for the next day's work till you have taken a little more of the 'ruddy bumper,' which you say is the soul of man below. His wife acknowledged that this was perfectly true. He began to reckon up those figures, and found what it meant lifting up an ounce so many thousand times, and the result was, he became a total abstainer, with every benefit to his health, and, as he admits, to his happiness. I would like those who take stimulants to give them rest, just to take the opposite side of the question into consideration, and see how the two positions fit together."

Young men are apt to entertain the foolish idea that in taking an occasional drink they are exhibiting a spirit of manliness, so ape their elders in this respect, the same motive prompting that induces them to smoke their first cigar; but when the habit is once formed, it is with difficulty broken, and too often proves a chain of such power that it seems impossible to sever it, and the victim is dragged by it down to a drunkard's grave. The only safe and manly course for a young man to pursue is to entirely discard the use of all alcoholic liquors; to shun the evil as he would a deadly viper, and not allow himself to become contaminated by its influence, as he certainly will more or less, if he partakes of it.

Adulteration of Liquors. — When we consider the evil effects upon the system of a frequent use of pure alcoholic stimulants, and the additional fact that the great proportion of liquors sold in this country are adulterated with poisonous drugs, it is no wonder that the army of men that yearly fill drunkards' graves is so large; the only wonder is that some of them survive as long as they do! The following report concerning the adulteration of liquors was obtained from an extensive wholesale liquor dealer in the city of New York, many years engaged in the business, and who has recently retired from it. On being requested to state the manner of adulterating liquors, he replied:

"If I should give you the tricks of the trade with my name, this city would be a hot place for me. But few liquor drinkers have the faintest idea in regard to the extent of the evil of adulteration. For instance, more than two-thirds of the stuff sold for brandy in this country is the meanest kind of poison. It is manufactured from an oil of cognac. Dr. Cox, the inspector of liquors for Ohio, after examining some of these imported brandies, said that the chemical tests gave him fusil oil as a basis, with sulphuric acid, copper, chloroform, tannic acid, Guinea pepper, and a small percentage of good brandy. The same gentleman, after testing liquor from a half pipe of 'splendid Seigrette brandy,' found evidences of sulphuric acid, nitric acid, nitric ether, prussic acid, Guinea pepper, fusil oil, and common whiskey.

Gin is considered a safe drink by thousands, who believe that it is the only liquor which escapes adulteration. They are mistaken. In most of the gin sold, there will be found oil of vitriol, oil of turpentine, oil of almonds, sulphuric ether, and extract of grains of paradise. It is in the manufacture of whiskey, however, that the adulterators do their finest work. You can purchase oils and essences from which 'whiskey of any age' can be produced. The style of whiskey when tested will show sulphuric acid, caustic potassa, benzine, and nux vomica, and other poisons. This is the sort of stuff that bores into the coatings of the stomach and cre-

ates ulcers. The adulterated stuff is murderous. In porter you will find opium, henbane, capsicum, cocculus indicus, copperas, tobacco, and sulphuric acid. In beer, alum, opium, nux vomica, green copperas, vitriol, sub-carbonate of potash, and jalap are used. Of course, ale of this character is dangerous to drink. If you don't believe me, drop in at any of the beer shops near the wharves of the East or North rivers and drink one of their 'schooners' that are sold for five cents. If it does not produce complete nausea it will surely cause intoxication. Cocculus indicus is used largely in this kind of beer. It is used to give strength to the beer. It is a small berry, very bitter, and of an intoxicating character. Three grains will produce nausea and intoxication; ten grains will throw a strong dog into convulsions. Now you can understand how strong men, after drinking beer dosed with this poison, lose for a time all power of locomotion. Fox-glove and henbane are used for about the same purposes as cocculus indicus. Jalap is used to offset the astringent qualities of acids. Oil of vitriol is used to increase the healing qualities of liquor, wormwood is used for its bitter and stimulating qualities, green copperas gives porter a frothy 'head,' and the drinker as well. Slacked lime is also to be found in adulterated porter.

We see very little of any kind of wine that is pure in this country. The champagne district in France is not able to supply us with more than a tenth of the amount of wine manufactured there — the remainder being held for European nations. We import more alleged champagne than the champagne district produces, consequently we get a bogus wine. Madeira is made here by extracting oils from whiskey and subjecting them to a chemical process, in which carbon is the principal agent. In astringent wines you find alum, Brazil wood, oak sawdust, lead, and copperas. Sugar of lead and arsenic are also used in wine. In the manufacture of one brand of Port, the washings of brandy casks, coloring made of elderberries, logwood, salt of tartar, green dragon, and tincture of red sanders are used. In pale sherry sulphuric acid, prussic acid, and alum are among the 'harmless ingredients' used to give color and the appearance of age.

As to lager beer, I don't suppose that there is a solitary brewer in New York who will have the hardihood to claim that he sells genuine lager; I doubt if a sale could be found for it. Why? Because pure lager loses its head, looks flat almost immediately upon being exposed to the air. The froth on beer which finds ready sale is produced by artificial means. I do not suppose, however, that lager is as dangerous to drink as other adulterated liquors, although I know that at one time large quantities of tobacco stems were used in many breweries. I believe that tobacco is still used in the alleged lager sold at the rate of five cents a schooner."

Use of Tobacco.—Besides being an exceedingly filthy habit, the use of tobacco in any of its forms is very injurious, the effect of tobacco upon the animal system having been carefully and critically studied by experimenting with nicotine (the oil of tobacco) upon animals, it being a deadly poison, and one of the most powerful nerve poisons known, the effect being tetanic convulsions followed by paralysis, and death through failure of respiration. The pulse is at first lessened and afterwards quickened, and the pupil of the eye contracted. The effect of tobacco can be very easily tested upon a toad or frog. By moistening a small quid of tobacco and placing it in his mouth death will ensue in a very short time. In man, when taken in sufficient quantity to show poisonous effects, tobacco produces giddiness, faintness, intense nausea, followed by vomiting and great feebleness, and general relaxation of the muscular system, as many a young man has experienced when first commencing to smoke or chew. The skin becomes pale and moist and the pulse feeble. If taken in sufficient quantity these symptoms would be greatly intensified and even cause death. Extensive internal application of tobacco will also cause death, as has been known in cases of young lambs and calves being washed in too strong a decoction of it in eradicating ticks and lice. The effect of tobacco upon different persons differs according to the temperament, their susceptibility to poisons, etc., habit making a vast difference with regard to the effect of the dose, the same as with opium, arsenic, and other poisons. A dose taken for the first time might be sufficient to cause death, which if taken after the habit were gradually established might produce no visible effects whatever. Dr. E. Curtis states as follows respecting the effects of the continued use of tobacco upon the system: "Chronic poisoning by tobacco, such as occurs from undue indulgence in the weed as a luxury, shows itself in dyspepsia, the smoker experiencing loss of appetite, especially in the morning, dry, foul tongue, and thirst; and in nervousness, as evinced by a general physical and mental restlessness, with undue susceptibility to external impressions, and by tremulousness of the muscles and palpitation or irregular action of the heart. With smokers, also, a form of chronic irritability, and even

inflammation of the throat and tonsils, is exceedingly common. Graver evils, such as paralysis, mental decline, and loss of sight from wasting away of the optic nerve, have been charged to excessive use of tobacco; but when we see the enormous number of persons who indulge heavily in the weed, and the comparatively rare occurrence of the affections in question, where there is not some other obvious and valid sense for the same, the claim that tobacco is to blame for the disease must be received with caution."

Cigarette smoking has become very common with young men within a few years, and this indulgence is regarded by many as less harmful than the use of cigars or a pipe. An eminent London physician expresses the following: "Scarcely less injurious, in a subtle and generally unrecognized way, than the habit of taking 'nips' of alcohol between meals, is the growing practice of smoking cigarettes incessantly. It is against the habit of smoking cigarettes in large quantities, with the belief that these miniature doses of nicotine are innocuous, that we desire to enter a protest. The truth is that perhaps owing to the way the tobacco leaf is shredded, coupled with the fact that it is brought into more direct relation with the mouth and air-passages than when it is smoked in a pipe or cigar, the effects produced on the nervous system by a free consumption of cigarettes are more marked and characteristic than those recognizable after recourse to other methods of smoking. A pulse-tracing made after the subject has smoked say a dozen cigarettes will, as a rule, be flatter and more indicative of depression than one taken after the smoking of cigars. It is no uncommon practice for young men who smoke cigarettes habitually to consume from eight to twelve in an hour, and to keep this up for four or five hours daily. The total quantity of tobacco consumed may not seem large, but beyond question the volume of smoke to which the breath organs of the smoker are exposed, and the characteristics of that smoke as regards the proportion of nicotine introduced into the system, combine to place the organism very fully under the influence of the tobacco. A considerable number of cases have been brought under our notice during the last few months in which youths and young men who have not yet completed the full term of physical development have had their health seriously impaired by the practice of almost incessantly smoking cigarettes. It is well that the facts should be known, as the impression evidently prevails that any number of these little 'whiffs' must needs be perfectly innocuous, whereas they often do infinite harm."

Boys on the Farm.—The grave question as to why so many young men from the country leave the farm for other occupations, and how to check the evil, is one of great interest to farmers' households and society generally throughout the country. Comparatively few farmers' boys, especially in New England and the Middle States, at the present time follow the occupation of their fathers, but there is rather a regular stampede of young men from the country to the cities and larger towns, and the places that should be supplied by them as intelligent and enterprising citizens are in a majority of cases filled with the lower type of the foreign element, so that many of our country towns formerly noted for thrift, enterprise, and the intelligence and refinement of their population, have become sadly deteriorated within the last ten or twenty years, while the city is overcrowded, and numerous applicants can be found for every vacancy that occurs, even when the salary is scarcely sufficient to defray the expenses of the board, lodging, and clothing of the applicant. This is a condition of things which does not augur well for the future welfare of our country, and ought not to exist. Farming *can* and *should* be made *profitable;* it *can* and *should*, as an occupation, be made *attractive*, and because it has not generally been made such is the principal cause for the evil in question. Another reason is because the farmers' boys do not fully understand the relation existing between the city and country; they hear of large salaries being paid the city clerk, and do not realize the great difference between the living expenses of the two localities, and that a man in the city is much more closely occupied and confined with his business than the farmer could possibly be. They are also led to believe that farming is not as honorable an occupation as some others. The reason for much of this false prejudice against farm life is that farming has not been conducted in the proper manner and its highest possibilities attained. If farmers wish their sons to regard farming as honorable, profitable, and attractive they should *make it such*, and by so doing there would need be no other inducement to require their children to respect and follow it. Professor H. E. Alvord very justly says in this connection: "The fathers and mothers who are at the heads of the farm homes of America must bear in mind that they are laying the foundations, in body and in character, not only of their successors in their own calling, but of the future leaders in almost all the walks of life. The great responsibility thus resting upon them cannot be too forcibly expressed or too keenly appreciated.

Parents make heroic efforts and show much self-sacrifice in educating sons and daughters *off* the farm, but it is a rare thing to see the same exertions put forth to specially educate their children *for* the farm, so that they may enjoy agricultural life, be successful in it, and profit by it. One reason why farming has been held in such low estimation is the idea which has so largely prevailed that any one can be a farmer. Many seem to think that from instinct alone, and without education or the aid of science, one can perform all that is necessary in that employment, and that success depends mainly on the amount of physical labor expended. Hence it has been too much the practice that when a person of ingenuity or fond of research—a youth of promise and eager for distinction—has appeared in the ranks of farmers his attention has been immediately turned away from agriculture to some other field.

The boy with an inclination for study and a taste for knowledge, instead of being provided with an education to render him peculiarly useful on the farm, not only by applying science to its operations, but also by enlightening his father and brothers in this and other branches of useful learning, is at once exiled from the homestead and put in training for one of what are called the 'learned' professions,—and despite the fact that all of these are overcrowded. Or if not a born student, but yet of superior address and enterprise, the boy goes to a commercial college and to the city to be trained as a merchant. Another that evinces unusual genius in the construction of things is fitted to be an artisan. And so it is that the boys kept at home for a supposed lack of talents are doomed to work upon the farm with comparatively few educational advantages.

Such a policy operates to deprive the farming community of its best talents, and in doing this to prevent elevation of character and success in the development of rural resources. The favored boys learn to despise the occupation of their fathers, and feel that it is an employment unworthy of them. Those destined to it feel correspondingly degraded and are apt to conclude that nothing but brute force is needed in the performance of their duties.

How can agriculture be expected to win its rightful place while such practices prevail to any extent ? and this picture is not overdrawn."

Some boys who have left the farm have done so because their natural tastes strongly directed them to choose a certain special employment, and under any conditions at home would have preferred to have chosen a different pursuit than farming. This is as it should be, for if all were farmers we should have no physicians, lawyers, ministers, dentists, merchants, mechanics, etc.; besides, when a person has a special and strongly marked talent in any particular direction he will almost invariably be more successful in following out his inclinations in that respect than if induced to choose a profession for which he has no inclination.

But with the majority of persons the inclination towards different pursuits is largely modified by circumstances and surrounding conditions, or is susceptible of guidance and direction under suitable influences; and the farmer who desires his boys to become farmers generally has it within his power to have his wishes gratified in this respect, if he uses this power judiciously and wisely. Many boys leave the farm because they are allowed so few privileges. We know of farmers who make life to their sons a routine of drudgery from morning till night, with scarcely any pleasures, recreation, or time at home, except to sleep and eat. The everyday clothing is shabby, and the best provided for especial occasions is of cheap quality, coarse, and perhaps quite ill-fitting, bearing a very unfavorable comparison with that of well-dressed boys, and which no child of ordinary intelligence could fail to notice. The table fare is of the coarsest and plainest food, with little variety, and the home for the household devoid of ornamentations and attractions. Scarcely ever is a holiday allowed for fishing or other recreation, or a little spending money ever granted.

We know of an old farmer whose management was precisely of this description, and when any of his boys chanced to earn a little money for themselves from a neighbor or stranger they were obliged to give it directly to him, which he took and put in his well-worn leather wallet with apparent satisfaction depicted upon his countenance, evidently considering that he was bringing up his sons in the best possible way to be frugal, economical, and honest citizens. To be sure, the child might be told that such money was to be laid by to help purchase him a coat, shoes, or other article of wearing apparel; but yet how much better to let the child feel that it was his own property, and permit him to keep it as his own, and to let him spend a small sum occasionally in purchases of his own — not to allow extravagant expenditures, but to teach him self-reliance, how to do business, and to let him feel that he had some rights of his own, some personal possessions — a feeling that would naturally stimulate him to plans of action and effort for the future — an ambition to do something in the world, and be somebody. The sons of the farmer above alluded to (every one of them) left him as soon as they

were old enough to leave home for other employment, leaving him alone in his old age, greatly to his sorrow; two out of the four, relaxing from the old severe regime of home life, became dissipated spendthrifts, while the daughters left home for employment in the city as clerks or teachers, leaving the old couple desolate indeed. This is no overdrawn picture, but is only one instance in many that can be found in real life, and is but the natural result of such unwise discipline. If farmers desire their boys to like farm life, they should try to make it attractive to them; the labor should be made interesting in order to be attractive; boys should be consulted about the farm management; should be given positions of responsibility and trust; should be allowed the ownership of certain farm animals, and be permitted to have the proceeds of their profit for their own. They should also be given the use of a small portion of land, and be encouraged to try experiments upon it, having the sole charge of it. Encourage them to set out a few strawberries, raspberries, grapes, fruit trees, etc., allowing them sufficient time to take care of them.

Commencing in this way, they will go on interesting themselves more and more in the business, if suitably encouraged, and will learn to like it. Farmers' boys should be well educated, and furnished with interesting and instructive reading on agricultural and other subjects. Labor-saving implements should be employed to the best purpose on the farm, in order to render the employment more profitable and less of a drudgery. Teach them to regard farming as just as honorable an occupation as any other employment by honoring it yourself. Make the home pleasant and attractive, and let them see that life is not all a drudgery — a place for coining money simply to hoard it up, and to make stern sacrifices of the necessary comforts of life. Let them be dressed neatly and suitably; treat them liberally, and in such a manner that they will feel that their social and intellectual advantages and privileges generally are fully equal to those of the sons of lawyers, merchants, or any of the other avocations or professions. Study to make farming a success, and thus let them realize that it may be made just as profitable as any other business, when the amount of capital involved is considered, and that it will admit of the same social and intellectual advantages; that there are possibilities in farming which the highest success yet attained has never reached. America's greatest philosopher has said: "The world is all gates and opportunities, strings of tension waiting to be struck; the earth, sensitive as iodine to light, the most plastic and impressionable medium, alive to every touch, and whether searched by the plow of Adam, the sword of Cæsar, the boat of Columbus, the telescope of Galileo, or the surveyor's chain of Picard, or the submarine telegraph, to every one of these experiments it makes a gracious response." It is the man that makes the business, and not the business the man. If farming has hitherto proved unremunerative, make it remunerative by adopting wiser and better methods.

Farmers' daughters should be taught to respect the avocation of their fathers, and not feel above performing the duties pertaining to the farm house — a foolish idea that is too frequently entertained in the farmers' homes of the present day. By treating children in this manner, they will acquire an interest in, and love for farm life, and be more liable to follow it, and succeed in it when they attempt. We are essentially a nation of farmers, and no country in the world has agricultural facilities that can at all be compared with it. Agassiz once said: "In Europe everything is done to maintain the rights and honor of the few; in America everything is done to make a man of him who has any elements of manhood in him." We would say to the farmer: teach and train your sons and daughters in such a manner as to develop to the highest extent the elements of true manhood and womanhood in them; elevate and honor your calling. By so doing, taking advantage of the best experience of others, you will not fail to render it a success for yourself, or to make it honored and loved by your children.

PART IX.

HOUSEHOLD DEPARTMENT.

THE HOME AND THE HOUSEHOLD.

THE influence of surroundings is so potent in moulding the character, that we have to see but a very little of an individual — frequently but a glance — to determine the atmosphere and general surroundings of his home life. Emerson well says: "A great part of our education is sympathetic and social. Boys and girls who have been brought up with well-informed and superior people show, in their manners, an estimable grace." The face and the manners will reflect upon the outer world the source of the influences that must hold sway, as readily and faithfully as a mirror will reflect the image of beauty or deformity that is placed before it, or the calm surface of the lake will show the character of the heavens that are over it, whether bright and sunny, or frowning with the gathering storm. Pleasant and genial surroundings have a potent influence upon all, and especially the young. The child reared in a home where he is constantly brought in contact with rude, coarse-mannered people, and hears harsh words and unkind criticisms, will be rude, coarse-mannered, and unkind himself, when his nature might have been such that, under proper influences, he would have been the refined, genial, kindly-mannered, and noble man, an honor and ornament to society, instead of the coarse, brutal, and clownish boor that his home surroundings fashioned him into. The home should also be beautified, and made as attractive as possible. This can be accomplished without great expense, for the most expensive things are not always the most tasty and attractive. Bare walls and meager surroundings do not have a tendency to develop refinement and taste in a child. Study to make the home not only genial with pleasant books and kind and loving words and deeds, but attractive to the eye, such as shall cultivate a taste for the beautiful in art and nature, for this will have a refining and elevating influence. However humble the home may be, it should be pleasant, genial, tasty, clean, and comfortable. Never permit your child to feel ashamed to say to a friend or stranger: "That is my home." Good books and papers should be furnished for the home reading. Music in the house is also a source of much pleasure, and has a refining tendency, and binds its inmates in closer harmony. Many a boy with a taste for music would be kept from being away from home evenings, and perhaps thus saved from evil associations, if he could have his taste for music encouraged and gratified. Good musical instruments can now be obtained at such prices as to be within the means of almost every farmer, and money thus spent will often prove an investment of inestimable value to the children in its direct and indirect influences. Besides, the good influences of music in the home, and the pleasure derived from it, it also furnishes an excellent means for entertaining company in an easy and pleasant way. Pictures upon the wall, and other ornamentations, a trellis of vines by the doorway, flowers, shrubs, and trees, and everything that has a tendency to adorn the home, are all silent yet potent in their power for good, and lead in the right direction.

Hygiene of the Home. — One of the most prominent causes of disease is the carelessness and neglect so commonly seen respecting the sanitary conditions of the home. Neither is this neglect to be attributed to the city alone; people — especially country people — are apt to regard the country as the most healthful and free from disease of any place on the face of the globe, and the city as the hotbed of disease and filth, without stopping to consider that it is the *conditions* and *not* the *locality* that renders a place healthful or unhealthful. The causes of diseases in country homes have been most ably set forth by Dr. W. R. Bartlett, of New Haven, Conn., in the following, which we insert with the hope that farmers and their households may heed the instructions herein contained, and be greatly benefited thereby: "The causes of diseases in country homes may be divided into two great classes: those due to habitations and their surroundings, those due to method of life. By country

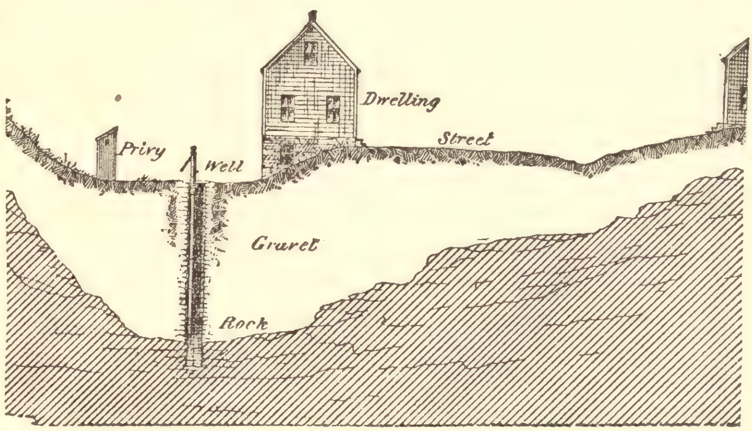
homes are meant those outside of, and removed from large towns, in places remote from the influences of overcrowding and the atmospheric contaminations due to such causes, as well as the *débris* produced by large bodies of people. There are two classes of these homes: first, those which stand alone and separate from other abodes; second, those which are more or less connected with others in towns of small size. There are no more suggestive thoughts than such as are connected with these abodes, and particularly those of the first class. They are the peculiar waymarks of history; these old houses are to our social life what the broken temples of Italy are to art, what the geologic rocks and strata are to the history of the earth. One can read in them the successive eras and periods of that 'struggle for life' through which the inhabitants of the various sections of our country have gone. The early progress of our social evolution can be traced as plainly as any geologic record — at the outside in the scattered heaps of stones or mounds of earth, and a little later in the huge remnants of old chimney stacks, and still later in the broken frame-work, or again, further on, in the lonely, untenanted old house, tottering and ready to fall; or each period is illustrated in some single old manor house, still inhabited, which has stood strong against the ravages of the years. Here dwelt our fathers in their stern simplicity, and here abide their children now, in the abodes of a more advanced and complicated method of life, and their history, as related to health, may be stated concisely as follows: The early homes were primitive; consequently they suffered from the absence of necessary sanitary conditions. The homes of to-day, on the other hand, suffer in a twofold way — on the one side from the same absence of sanitary requisites, and on the other from the improper adaptation to the comforts of a modern civilization. I propose to take up and consider the natural and artificial causes of disease in the country in the following order: those that arise in air and water, those that are due to food and clothing, to habitations and to occupation.

Air.—The atmosphere, the world over, has essentially the same constituents, but it varies in different localities in meteorological conditions; local causes also introduce certain extraneous matters. It is these two conditions which exercise an influence upon public health. In many localities the variation in the meteorological conditions of the atmosphere are comparatively large and rapid. These atmospheric elements exert an influence varying according to situation and exposure, or proximity to the Gulf Stream and sea-coast. For instance, what along the coast in winter is a fall of rain, a few miles back turns to a fall of snow, which remains more or less constant. A wind which, upon a high and exposed situation, pursues a direct and steady sweeping current, when it reaches a locality circumscribed by hills, whirls and eddies around in irregular waves and with broken force. On the sea-coast the atmosphere may be loaded with moisture, while inland it is dry. Any one who has happened to ride in the country just at dusk, cannot have failed to note the diverse qualities of the air through which he passes. If, for instance, he descends abruptly from moderately high ground, and travels along the lower meadow lands, through which, it may be, runs a small stream—conditions constantly met with in many parts of the country—he will at once observe a peculiar chill in the air and a heaviness which penetrates to the skin, so sudden is the change. These conditions must of course exercise an influence upon the health of those who are subjected to them. They may be compared with certain kinds of clothing which vary in texture and thickness, and so in the sensations which they produce. These strata of the air envelop the body, and cause a sense of warmth or a chill, an enlivening or depressing influence, according as they are wet or dry, or warm or moist. Of those diseases which are due in part to the natural conditions of the atmosphere, consumption is to be particularly named; this is caused by the sudden and large variations which have been named, and without doubt it would be found, upon investigation, that the low grounds which have been alluded to predispose to the disease. It also occurs to a greater extent upon the sea-coast, and in localities situated between adjoining hills.

So, too, catarrhal and bronchial diseases and rheumatism, and also malarial and typhoid diseases, are produced by these circumscribed localities. Pneumonia is another disease especially to be noted as due to atmospheric causes, and it sometimes sweeps as an epidemic over a large area of country. Mr. Haiviland, a recent English writer, states that valleys shut in with stagnant air and retentive soil productive of humidity, predispose to rheumatism and its frequent concomitant, heart disease, and the more so when the population are ill-clad and exposed to the weather. Then there are other elements which pervade the air as poisons and sweep over it with varying degrees of virulence, and are made manifest in epidemics of diphtheria, influenzas, and eruptive diseases, and in that hitherto insidious and unexplainable influence named malaria, which has been for the last few years gradually

working its way over sections of the country where it never appeared before. The above atmospheric causes of disease are for the most part natural and unavoidable, and must be guarded against by proper attention to exposure and protection of the body by proper clothing. We now come to removable causes of disease, which are introduced into the atmosphere by local causes and the habits of mankind. It is to this class that hygiene especially directs its efforts, but as they come more directly under the head of habitations they will be considered there.

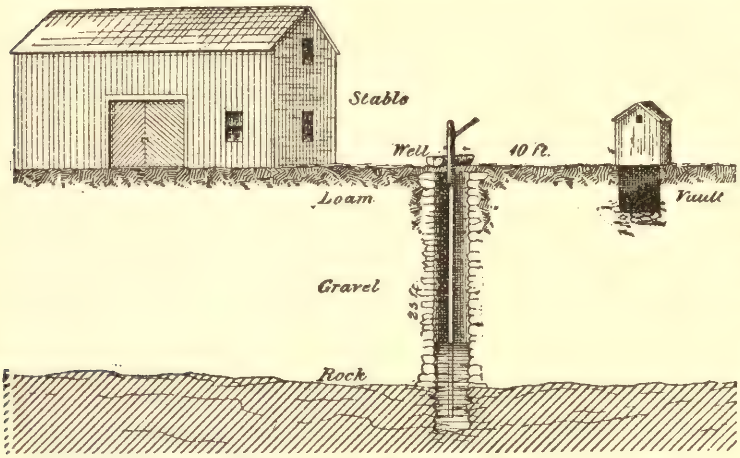
Water.—Closely allied to the air is another natural condition and necessity, which exercises a more potent influence upon the condition of health, viz.: water. This, again, is a constant combination, but, like the air, admits into its combination even a greater amount of foreign and deleterious matter, as well as that which is remedial in its effects. Most waters are comparatively free from mineral matters; but there are here and there springs containing iron, magnesium, and sulphur, and the various salts of potash and soda, which have a local or more wide-spread medicinal celebrity; and although any sample of water would probably disclose a minute amount of mineral matter upon analysis, yet as a rule it does not exist in sufficient quantity to produce injury to health. Almost all waters contain the chlorides, or lime in minute quantities. It is the organic and excrementitious substances which enter into it in solution that produce the mischief. These arise from two causes: decaying vegetable matters from vegetation which has flourished in lakes and streams, and the contaminations of water by local and artificial conditions, such as drains, privies, farm-yards, cess-pools, manufactories, etc. Nowhere is there more neglect shown upon this important point than in the country. Go from farm-house to farm-house, and I venture to assert that in ninety per cent. the sanitarian will find some neglect in this matter of water-supply, either small or great. A man, for instance, digs a well in close proximity to his house; at the same time he locates his drain for the sink and places the outlet within a few feet of the well, so that a mere layer of soil separates the one from the other; the consequence is, that while the insoluble matters may be filtered out, the far more dangerous soluble, impalpable matters are transmitted to the drinking water, to produce, if no worse, a slow and chronic poisonous influence upon those who partake of it. Instances have been mentioned, strange to say, in which a strange communication has been found to exist between the well and sink drain, and that, too, with the knowledge of the parties in interest. Another method of pollution by slops is the practice of throwing them upon the ground near the well, when in course of time they are absorbed into its contents. Again, the water may be taken from a spring at a distance from the dwelling, and the owner congratulates himself upon his superior supply of pure spring water; but if an examination were to be made of the source of supply, the chances are that it would be found to be in a neglected condition, partially filled with decaying wood or leaves, and its bottom covered with finely pulverized decomposed vegetable matter. Or he may take his water from a cistern fed from the roof, a practice which should be avoided if possible. If this is not properly ventilated it becomes foul from neglect, the water acquires a foul odor, and its use is injurious to the health.



HOW WELLS ARE POLLUTED.

Again, the farm-yard is often located within a few rods of the well; the consequence is, that a similar contamination takes place as in the case of the drain, and after a rain, when the soil becomes saturated with these matters, they are taken up by the underground water-passages and transmitted to the well; often the water is discolored, and has the taste and

smell of the barn-yard. The same pollution may occur by reason of the improper location of the privy, though I believe that it does not occur as often as in the case of the others, for sanitary work usually begins here, and even the mind uninstructed in sanitary matters recognizes in a measure the dangerous character of human excrements, while it fails to see the danger which lies in the emanations from barn-yards and decaying vegetable matters, from a belief that Nature is competent of herself to dispose of them. It is not necessary to mention in detail the diseases which arise from impure drinking water. Typhoid fever is one of the most important, and every country physician can call to mind cases in which he has traced the disease to one of these sources of water-pollution. But there are certain obscure cases of disease from this cause which are often overlooked — cases of marasmus, so to speak, in which there is no well-defined malady, but a train of irregular symptoms, one or more in a family being affected; there is a general feeling of *malaise*, loss of appetite and weight, alternations of diarrhœa with periods of regularity, and so on. These symptoms cannot be accounted for on any ordinary principles of disease, but many times they are due to a chronic poisoning from impure drinking water. Ask one of the family if the water is good and the reply will be, "Oh, yes, doctor, we have the best well in the neighborhood," and they will show a specimen. It may be perfectly clear and tasteless, and apparently pure; but an examination of the sink drain—one of the other methods of well pollution—will disclose them in close contiguity, and evidently discharging a subtle poison into the water. The important fact that apparent purity is not a safe guide in estimating the purity of water is not generally known. But it is true that analysis even often fails to detect the element which produces disease, when it has been established beyond a doubt that it does exist in the water; the only safe criterion, then, is absolute removal of the cause.



POLLUTION OF WELLS.

Food. — "Give me an old-fashioned country dinner," sighs a well-fed man of the world, tired of and satiated with the delights of artificial cookery; and indeed there is nothing better calculated to appease the appetite and nourish the system than such a repast properly prepared and cooked; but unfortunately our cookery is not of this high character; and I am compelled to go even farther, and say that country cookery, as a whole, is behind the age, and in its preparation advantage is not taken of the knowledge which science so readily affords. All the requisites for good food are met with in the products of our country homes, but how sadly are they misused. Take, for instance, the cooking of fresh meat. In the great majority of cases it is put into the frying-pan with a little fat, and then subjected to a scorching or frying process at an intense degree of heat, which soon deprives it of its juicy elements, and it goes upon the table dry and hardened and difficult of mastication; and at last, when it does enter the stomach, and the process of digestion is accomplished after much labor and exhaustion of nerve force, it affords but a tithe of the nutriment which it originally possessed, and which proper cooking would have developed and saved. Take, again, the article denominated pie. I shall not attempt to detail the process by which flour and fat are mingled together and subjected to the baking to bring forth that indigestible compound known as pie-crust; but it is safe to say that it is responsible for a large share of the adult dyspeptics and pale, sickly children we are constantly meeting with in this country, the chief delight of this latter class being to invade the pantry and feed upon a huge slice of this compound, until the stomach is gorged to repletion, and digestion weakened and exhausted. There are few housewives who know

how to make good bread. It can be made, all the elements are at hand, but, either through ignorance or carelessness, a large proportion of it is heavy and indigestible, and what is really one of the most important and nourishing articles of food greatly impaired in its usefulness, and even made the vehicle of harm to the system.

So I might go on and mention other articles and methods of badly cooked food—as, for instance, the boiling of potatoes, which, improperly done, brings to the table hard, water-sogged masses, instead of a delicate, feathery, nutritious article of diet. The whole matter may be summed up as follows: too much haste in compounding and cooking is allowed—this partly from multiplicity of duties and partly from carelessness. But, above all, there is a lamentable want of knowledge on the part of the wife and mother, of those principles which should guide her in the preparation of the daily food of the family. It is not chimerical to say, that the housewife should know the general divisions into which food is classed, and what elements each class tends to build up. She should know theoretically what many have found practically, that half-boiled potatoes cannot readily undergo solution in the gastric juice, and that pie crust reeking with fat cannot be absorbed into a healthy system without poisoning the blood, and that it produces a nauseous emulsion in the stomach, which can never be assimilated into healthy fat and tissue. Did she know these simple truths, she would take a maternal interest in preparing such articles of diet for her children as they needed, and would point to her rosy-cheeked, well-developed offspring, as the results of her labor.

Clothing. — Passing to the consideration of clothing, there are one or two points where our country residents display a degree of carelessness which cannot be otherwise than injurious, although, as a rule, they are sufficiently well clothed. One point is the neglect to wear proper clothing next to the skin, and especially in summer. It is a common practice among farmers to dispense entirely with the wrapper or undershirt during the summer, and wear only an ordinary cotton shirt next to the skin. Such a practice is dangerous, for when work is stopped, then there is a sudden cooling of the skin and lowering of the temperature, and a consequent liability to the induction of disease. Rheumatism, stiff-joints, and kidney-disease are all produced by this sudden suppression of perspiration and lowered temperature of the body. Now, a flannel undershirt of proper thickness, or simply a flannel shirt, worn during the summer, would lessen the danger by graduating the condition of heat. Again, mothers are apt to forget the delicate structure of their infants, and neglect to give proper attention to their clothing. In summer the dress is too light; thus they are exposed to those atmospheric influences which produce cholera infantum and kindred ailments; while in winter, from the same cause, they are made liable to pneumonia and bronchial diseases.

Habitations.—This is an important point, and one in which there is room for and need of much improvement. What then, are the considerations which influence a man for the most part when he builds a house in the country? If he be a new-comer he reasons substantially in this way: I must choose a pleasant, healthful location; it must be convenient of access, and near my farm or place of business; or, if it be a pleasure house, near the means of communication with other places. If he is an old resident about to construct a new house, he very likely demolishes the old house and builds upon exactly the same spot; or, if he selects a new location, he reasons generally like the former. In other words, both are guided in their selection for the most part by the considerations of eligibility, economy, or beauty of construction, and least by the apparent minor conditions which are to afford the household health. He neglects in the internal arrangement of the house to provide the best means for warming and ventilation, and the proper discharge of the sewage. And in the arrangement of his outbuildings he will very likely counteract in the most systematic manner the benefits of his naturally good surroundings. He will locate his barn within a few rods of the house, in order that it may be convenient, and lay out his barn-yard upon the side facing the house; or he will dig his well in close proximity to his house, and at the same time make the outlet of his sink drain discharge within a few feet of it, or his privy will be located within a few feet of the doorway; it will have simply a vault as a receptacle, which is not often cleaned or disinfected. Again, his cellar may be dug in springy ground, from which water and dampness are constantly exuding, to rise and chill the rooms above. This matter of damp cellars is one of great importance, from the frequency of their occurrence. It is not uncommon even to find cellars in which water is constantly standing, often mixed with decaying vegetable matters and the filth which has gradually accumulated there through neglect and carelessness. The writer has in mind such a home, in which one of the family was taken down with typhoid fever and died. A short time after another was also attacked

with the disease. That was a time when physicians were not as alert to discover sanitary defects in the household as they now are, so it went on until the third member of the family was attacked; then diligent search was made for the cause, when it was found that the cellar bottom was constantly covered with water, mingled with decaying vegetable substances.

This is no isolated case, but can be verified by the testimony of many. In such a way, an otherwise fair home is surrounded by a cordon of disease-producers, while the owner flatters himself upon his desirable and healthy location. The question now recurs, How should a man reason in the construction of a home in the country? Something like this: I am about to construct a house, which is to be the home of my family, consequently I must consider, first and above all, how best to adapt it to the health and comfort of its occupants. I must realize that the causes of disease to which we shall be subjected are many of them to be of our own making; and if I construct my home so as to avoid them at the outset, I shall be teaching them a lesson, and inaugurate a course of action which they will naturally learn to follow. The man who reasons thus will reason simply and intelligently, and his home will be a model worthy of imitation. It is no difficult matter to construct a home in this manner. No one rule can be laid down for all cases; but if the importance of building upon sanitary principles is once realized, there is no place where it can be more easily and better done than in the country. If the soil is damp, it should be well drained. In the matter of damp cellars, they should be well cemented, or sub-cellars only should be constructed, three or four feet deep, thoroughly cemented and ventilated. All out-buildings should be located at a safe distance from the house. The house should be warmed throughout, if possible, and all rooms should be thoroughly ventilated. Slop water should be disposed of in such a way that it cannot contaminate the air near dwelling houses. The best way is to deposit it upon the surface of the ground, not near the dwelling, by means of suitable discharge pipes. All tanks, cess-pools, reservoirs, etc., for storing liquid or solid refuse, should be looked upon as likely to cause serious trouble. If they are used, they should be made tight and frequently emptied. Water-closets should be used if possible; if not, there should be a frequent disinfection with dry earth, and prompt and complete removal of all excrement.

The line of thought has thus far been directed to the homes of the well-to-do and industrious part of the community. But there is another class in the country—namely, the poorer and impoverished class—to whom a special consideration is due. In every town and hamlet they are to be found, and usually congregated together in one locality. Of all poor people, they are the poorest. Seemingly without energy or decision of character, they go on through life surrounded by the means of comfort and a livelihood, but yet are content with a bare existence. Most of them have intermarried into the same class, and have thus produced a numerous offspring, possessing the same qualities of mind and character; and so the succession is kept up from generation to generation, and the passer-by of twenty years ago, should he revisit the same locality, would see the identical worn and dilapidated houses that met his gaze before. These people are many of them well-meaning, some of them industrious, but it is no misrepresentation to say that among them are found the open vices of our country homes, for the most part. It is common among these families to find one or more of them the victims of their own or their parents' vicious habits. It may be phthisis, or epilepsy, or idiocy which they are afflicted with, but the cause may usually be traced to their immoral habits, or to intemperance and irregularity of life. Much is due to intemperance, for this is their special vice; they are the village rumsellers' main support—for among the better class this vice is comparatively little practiced. Almost all the male members of this community are habitual drinkers, and many of the female portion also; and when they reach middle life are more or less broken down by the effects of this habit, while the children follow in the same course at a slower pace. The amelioration of this class is a problem for the philanthropist, as well as the physician, and it is a difficult one, too; but a united action on the part of the profession, backed by the better part of the community, can do much toward their elevation, and particularly in the matter of intemperance. The closure of the low groggeries from which they obtain their poison would be a beginning in the right direction, which would lead to a higher moral standard, and thus toward permanent results. Systematic effort applied to the elevation of this class of people, which familiarity has made contemptible, would materially lessen the number of those supported at public expense in jails, hospitals, and reformatory institutions generally.

Occupation.—Most of the inhabitants of our country homes are engaged in the occupation of farming, though, of course, manufacturing is carried on to some extent; but most of these are located in the larger towns, and do not come within the scope of this paper. The causes of disease, then, which fall to our consideration as due to occupation are those

pertaining to farm life, as relates to the male portion of the community, and to domestic or indoor life, as relates to the female sex. The question, then, at once arises, Is farming healthful? It would seem to be the height of folly to attempt to disprove, or even criticise, this almost universally accepted belief. Let it be granted that the principle is true, yet there remain certain aspects of it through which the lover of honest criticism can easily penetrate. Farm life possesses three beneficial elements: constant physical development, abundance of pure air, absence of excess and simplicity of life. Against this must be set three elements of danger: constant physical and mental strain, irregularity of life, exposure to the inclemency of the weather. That it is possible for the farmer to so conduct his affairs as in a great measure to reap these benefits, and not expose himself to the dangers, cannot be denied; but practically he does not often do so. A sketch of a farmer's life will make this apparent. A young farmer sets out in life, ambitious of a competency. He rises early, and goes at once to his toil. After a hasty breakfast, the regular labor of the day is begun, and continued till noon, when he gives himself a short dinner hour, then resumes his labor and continues it through the day, till, worn and weary, he seeks his home at night. Completely exhausted, too tired for recreation, he is obliged to spend his evening in quiet to recuperate himself for his next day's work. Often he rises in the night-time and takes a long journey to the neighboring market, exposing himself to the chilly night air, and careless as to his clothing; and if he returns before the day is done, takes up some unfinished task and continues his labors again till night, devoting but scant time to rest and food. This course of life is continued day after day, and year by year. In the meantime he is economical, and laying up a competency; but is steadily breaking down his physical health, as his weakening constitution and stiff joints so often testify.

This surely is a picture of excess, and one in which the good elements of farm life are sadly perverted and misused. It is not only a physical wear and tear, but what is more, the mind often sympathizes and becomes broken or enfeebled in its operations. The records of the Connecticut Hospital for the Insane, for instance, show this with startling emphasis. An inspection of them shows, that of the whole number of males admitted from the beginning, of the various occupations 170 are farmers, the total number being 773.

Farmers' Wives.—We pass now to speak of farmers' wives. The same records show that, of the whole number of females admitted to the Connecticut Hospital for the Insane from the beginning, which is 558, 215 are housewives, and of course for the most part the wives of farmers. When one considers the method of life of this class of persons, it does not seem so surprising. Take for illustration a young farmer's wife, the companion of him who has served as our previous example. She may not be very strong physically at the outset; but be that as it may, she enters into all the plans of her husband with alacrity, she assumes the entire control of the house and does her own work; this is well enough at the outset; but soon she enters upon the maternal state, and a young and increasing family becomes a part of her care, and draws upon her in a twofold way; she bears not only the physical strain of child-bearing, but also continues to perform her own household duties; her husband's business still increases, adding more yet to her already multiplied duties; but still she presses on, and so continues, till her pale, anxious face and weary step tell of a constitution broken at once mentally and physically. This is no imaginary picture, but one enacted continually among our farming people to-day. The average farmer's wife is one of the most patient and overworked women of the time. One has only to attend one of our village churches on some Sunday in the summer to obtain a critical view of our overtaxed farmers and their wives; a glance over such an assembly reveals a set of faces whose very lineaments are drawn and wrinkled from overwork; they tell of lives of constant, unremitted toil, the signs of which even a Sabbath day's rest cannot at all efface. It may not be necessary to speak of the occupation of the children, yet there are one or two points not to be overlooked. It has passed into a truism, that farm life is the right kind of life for a pale, sickly boy, but true as this may be in a general sense, there are yet many exceptions which should not be overlooked. Take, for instance, the younger child of this pair above described. He is, perhaps, a weak, frail child, and when he reaches the age of six or eight years he begins to labor on the farm, doing such light work as he is supposed to be able to bear. As he grows older his tasks increase; at the same time he is pursuing his course of study at the district school; but gradually he acquires the same habits as his father, and his growing body is subjected to a strain which it is ill able to bear, and he grows up weak in body and mind, an old man at twenty, or it may be dies of phthisis, while engaged in the very occupation which popular opinion calls the most healthful. It would not have been so in his case, had his life been properly guarded, and he would have

developed into a healthy manhood, had his labors been properly adjusted to his strength and his life been conducted upon hygienic principles. Parents, in choosing a course of life for their children, should consider whether the child can bear the strain of farm life, and whether it coincides with his mental organization, and should so shape his course that he shall leave the farm at a proper age for some other occupation if his constitution so demands, and then the sickly young boy often develops in strength and bodily health. The cry so often uttered, "Keep the boys on the farm," is a senseless one, indiscriminately applied, and cruel in its working; for the boy who is not adapted to that occupation should not be subjected to it, any more than the thin-skinned, delicate-limbed horse should be harnessed down to the plow.

The salient causes of disease in our country homes have thus been passed in review, in the hope that the attention of the people will be thus in a measure attracted to matters of such vital interest to them and their children."

Sleep. — Sleep is one of the great restorers of wasted vigor and strength, and is one of the most important requisites in maintaining health and vigor of both mind and body. It has been called "Nature's repair shop," where all the repairing of the body and mind are secured. There is nothing that can take its place in this respect. One of the leading symptoms that frequently precede insanity is an unnatural wakefulness, and inability to sleep, showing an intense nervous condition. A disordered state of the nerves can best be cured by a full amount of refreshing sleep. Many a man and woman has grown prematurely old, and perhaps broken down and died at middle age, simply from over work and loss of sleep, when if they had taken more time for sleep they might have lived to an advanced age. Farmers and their families, as a rule, do not spend the amount of time in sleep they ought. Professor Chandler, President of the New York Board of Health, states that one-half the deaths that occur are unnecessary. With a view to lessening the rate of mortality, he urges upon every person to apply the best knowledge obtainable to the care of his own human machine. "No board of health or city government," he says, "can do away with sickness unless each one carefully guards himself." He dwells at length upon the necessity of pure water, wholesome food, sufficient clothing, sunlight, rest, and recreation as all-important if one would possess good health.

Children are constantly being injured mentally and physically from not having sufficient sleep. They are taught that it is laziness to lie in bed beyond a certain hour in the morning, and that there is great virtue in "early rising," or are forced to be up early under all circumstances, and are therefore deprived of the full amount of sleep that their constitution requires for a healthy development. One has but to look into the prematurely old faces of little children that work in the factories or shops to notice this, as well as of many boys and girls that are found in farmers' households. Some persons require more sleep than others; each one must be a law unto himself in this respect. Children require much more than grown people, and young and middle-aged persons more than old; while in each individual case there will be a great difference in this respect. Some of the greatest workers in the world have been the greatest sleepers, and because one person requires more sleep than another, it is no indication of indolence in the latter, or of great industry in the light sleeper. Many incurable nervous diseases are brought on by a lack of sleep, while on the contrary we have known serious and seemingly incurable difficulties of this kind completely cured by having a full amount of it. A good rule in this respect is to allow a person to sleep as long as he will sleep sound. Idling the time by lying in bed in an indolent, half-dozing state is not sleep. If parents wish their children to arise early in the morning they should see that they retire early at night in order to have the full amount of rest that their systems require.

Recreation, Visiting, etc. — Farmers and their families are generally so busily occupied, that they feel unable to take much time for recreation, visiting, entertaining company, etc. While labor is a duty as well as a necessity, and the practice of industry a virtue, and the road that leads to health, happiness, and wealth; and while idleness is a vice with its long train of attendant evil consequences, yet there is danger in the majority of cases among farmers of perverting the good that may result from industrious habits into evil, and making life a mere drudgery, with comparatively no recreation, and the almost entirely ignoring of the social relations of life. It should be remembered that every one requires periods of recreation and rest; the health demands it, besides such periods are bright spots in life that lighten and cheer the days of toil. It is positively injurious to the health of the mind and body to be constantly occupied in one little round of duties, with no change, no variety to give relaxation. If the farmers of our country and their families would work less hard, take

more advantage of the improvements and facilities for labor saving, and adopt methods of improved agriculture more generally, and spend more time in rest, recreation, and the cultivation of the social qualities than the majority of them do at present, farming would not only be more profitable and less laborious as an occupation, but there would also be more of health and happiness connected with it.

More holidays should be observed by the farmer than there now are. Each household should have holidays and anniversaries of its own to be observed, such as birthdays and marriage anniversaries. Let each child feel, by some pleasant notice being taken of its birthday as it comes around, that it is an event to be honored, and looked upon with pleasure, and that they are of some importance in the world, and it will tend to brighten life, and endear home and its memories to the heart in after life.

Winter Evenings.—The long winter evenings afford the opportunity for pleasant social enjoyment in the household, such as conversation on special topics, the establishing of a home lyceum, reading aloud, singing, instrumental music, pleasant, quiet games, or those that are of a more social nature, such as charades, character personations, etc. These should be sanctioned and sometimes participated in by the parents. Children require some amusement; they cannot move according to fixed rules, like mere machines. They are active, restless, eager for occupation, fun-loving and social in their nature, and they must have relaxation of some kind. If they cannot have amusement at home, they will be very likely to seek it abroad as soon as they have the opportunity. Many a youth has been led to seek amusement in the exciting scenes of the gambling table, liquor saloon, and other places of evil associations, because his home was lifeless and dull, and its associations had nothing to amuse, instruct, interest, or attract. Under such influences he soon becomes reckless and dissipated, and goes down to ruin, only another instance of a blighted life, which in all probability pleasant home associations might have ennobled and saved to future usefulness and honor. The isolation of the country dwelling should suggest to the farmer the special necessity of his favoring and providing home amusements for his children. The memory of a beautiful, happy home, with its hallowed associations and teachings, has saved many a man from yielding to temptation and treading a downward course, and is one of the richest legacies that parents can leave their children.

Kindness and Politeness in the Household.—Many persons are very particular respecting their manner when in the presence of strangers, or when away from home; while at home, and to the members of their own household, they are at times very unkind and impolite in speech, as well as in manner. True politeness is kindness expressed in a pleasing manner. While we should ever be polite in our treatment of strangers and those with whom we come in contact, to whom is greater kindness and civility due than those endeared to us by the ties of affection and nature? It is not uncommon to see husbands and wives show such marked incivility towards each other as would be regarded by either as not to be tolerated in the common civilities among refined and cultured people. The same may be said of brothers and sisters. This is what should never be. The home should be the dearest spot on earth to its inmates, who should entertain for each other that affection which the nature of their relations would naturally incline, and, such being the case, scarcely too much care can be taken to avoid the least unkindness of look, word, or deed; neither should the little civilities that would be accorded a stranger, for whom we have no especial interest, be disallowed under similar circumstances to those we most love. This incivility is generally the result of carelessness or thoughtlessness; yet, notwithstanding, it has much to do towards marring the happiness of home life, and in warping the character of both those who practice and receive it. To be sure, home should be the place, of all others, of freedom from restraint, where we lay off the formalities of society; yet we should not abuse the liberty of home life, and blight its pleasure by the practice of such unkindness and incivilities as would not be tolerated outside the home circle. A pleasant "thank you," "excuse me," or "please," in receiving a favor, making an apology or request, costs nothing, and is as justly due the loved ones of our own families as to the outer world, while they do much to soften and refine the character, improve the manners, and brighten everyday life. There should be more affection manifested and more confidential relations established between the different members of the household than is usually seen. Parents should be careful to set the example of politeness for their children by being polite to each other and to them, thus teaching by example, as well as by precept, which is by far the more forcible. Parents have no right to expect their children to take a higher standard in any respect than they themselves have taken and are daily occupying in their presence. They should seek a high moral, religious

and social plane, and teach their children to do the same. Children should remember that they have duties which they owe their parents, obligations that they can never fully repay, and should endeavor in every way possible to make home pleasant for those who have bestowed so much care and affection upon them.

The late Alexander Hyde has well said: "Not every farmer that builds a spacious and convenient house for his family succeeds in making that family comfortable. Together with the building of his house he must build himself on the solid foundation of all manly virtues, and together with the culture of his farm he must cultivate all kindly affections. Nor should these affections be confined to those of his own household, but extend to his neighbors, and to the whole brotherhood of man. The farmer's home should not only be the trysting place for children, grandchildren, and relatives, but the seat of refined and generous hospitality. God has made us social beings, and he only enjoys home in its fullest extent who there ministers not only to the wants of his family, but entertains his friends cordially and liberally. In thus laboring for a comfortable home and cultivating all family and social affections, and ever cherishing gratitude to the Giver of all good, we may confidently expect that our homes will foreshadow the perfect bliss of heaven."

Practical Suggestions to Housewives.—SLOVENLY HOUSEKEEPING, ETC. Slovenly housekeeping has been the cause of untold discomfort and unhappiness in life, while a neat, tastily arranged, orderly kept house adds greatly to the comfort, health, and pleasure of the household. Besides the comfort of an orderly house, it is much more easy to keep things in order than to be constantly searching for mislaid articles, and thus keeping the whole house in a turmoil. Many housekeepers take the hardest way of doing everything, are always hurried with work, labor hard from morning till night, yet never reap the benefits of such labor, because they do not plan their work well, and have no system or method in performing it. They have no regular place for anything, and are constantly mislaying things that have to be hunted up. There should be a place for everything, and everything kept in its place. In this way, much time and labor will be saved, and a great deal of discomfort avoided. Perfect cleanliness in every department of the house is essential to the preservation of health. Never permit any decaying matter, such as vegetables, fruit, etc., to remain in any of the rooms, or the cellar, as fevers, diphtheria, and other similar diseases are frequently caused from such carelessness. Allow no disagreeble odors about the premises to escape your notice, and when there are such, search until the cause is found, and then have it remedied. Be neat and orderly about your dress as well as your house. This may be regarded as one of the "little things" by some, yet it is the little things of which life is made up, and by which much of its happiness or unhappiness is regulated. Study economy and avoid extravagance, and in so doing it would be well to consider what true economy consists in, as well as the nature of extravagance. True economy does not consist in always buying things of *poor quality* because they are *cheap*; or extravagance the purchase of a good article that will last several years, and paying a reasonable price for it. As a general rule, articles of the best quality are the cheapest and most satisfactory in the end. Not unfrequently the slight improvements, made at a trifling expense, through the influence of the wife's taste and tact, add more to the value and attractiveness of a home than many times the expenditure invested under the husband's management.

In no position is inefficiency more deplorably felt than in the household, since a slovenly, inefficient housekeeper has it within her power to mar the happiness of so many others—her husband and children—whose home atmosphere and comfort she so largely creates, and she requires much ingenuity, capability, and tact, in order to meet fully the requirements that are within her especial province.

Inordinate Neatness.—The opposite extreme of slovenliness, is inordinate neatness; in other words a neatness which is such a severe regime, that it precludes the use and reasonable enjoyment of home, and the things pertaining to it. There is not much comfort in a house where everything in it is regarded as too sacred for use, or a particle of dust regarded as a calamity, while the one who is the cause of the slightest disarrangement of the regular plumb and line system is subject to the severest criticism, either of look, act, or word. We have seen homes where the order evinced was of such a severe nature as to cause a feeling of restraint that was absolutely painful, and one would feel relieved and free when getting out into the open air again. True hospitality rarely prevails in such houses. Company are regarded as intruders; they disarrange the books and furniture, which require care and labor to rearrange. The wife and mother cannot throw off her household cares and sit down to the enjoyment of conversation with the old friends, or enter into the enjoyment of her

children, because of her "much serving." Such should remember that a heart-felt word of welcome, and warm clasp of the hand, are far more to a guest, than the most exquisite carpets or furniture, or spotless table-linen. There are bare cabin homes that will be cherished in the memory with pleasure, because of the beautiful and loving presence there, and stately palaces that will leave upon the mind the chill of an iceberg,—shining and glittering, but cold, and forbidding. Furniture and other home appointments were made for comfort and enjoyment, and not especially for being set apart at right angles in a room, or to be kept for ornament alone. Don't put all of the choice and beautiful things apart for strangers' use alone, let the "best room" be the one in which the family spend the most of their time; such a room should be in the most pleasant and sunny part of the house, while nothing in the house should be regarded as too good for its inmates to enjoy.

Fretfulness.—Goethe says, "He is happiest, be he king or peasant, who finds his happiness at home." Archdeacon Hare has well expressed the idea of home as follows:—"To Adam, Paradise was home, to the good among his descendants, home is Paradise." One of the highest privileges of mankind, and the central duty of life, is the creation of a refined and happy home. Such may be justly regarded as the best product of Christian culture. Home should be the most pleasant place in the whole world for every inmate of the household, and the place in which each will most desire to spend evenings. But it too frequently happens that the husband and sons spend most of their evenings outside of the home circle. When such is the case, it would be well for the wife, the mother, and the sisters, to ask themselves whether they are individually, either directly or indirectly, responsible for this. A habit of fretfulness is one of the great faults seen in many homes. A nervous, irritable disposition is indulged in, until the habit of fault-finding and fretfulness becomes confirmed, and is frequently showing itself with the slightest provocation, or with no provocation at all. One such inmate in any home will destroy much of the happiness of all the others. Life has many cares and responsibilities, but we must meet them, and meet them bravely and cheerfully. Don't add to their weight by repining and fretfulness. Be patient, kind, and charitable to all. Many a true heart has been estranged by an impatient look or word, thoughtlessly given, and after wandering, would have come back after the first transgression like the dove to the ark, had it not been frightened beyond recall by the angry taunt,—the cruel charity of an unforgiving spirit. Cultivate patience and cheerfulness, not alone for your own sake, but for the sake of those about you whose comfort and happiness you, as wife and mother, have it so much within your power to control.

Emerson, in referring to heredity law says: "At the corner of the street you read the possibility of each passenger, in the facial angle, in the complexion, in the depth of his eye. His parentage determines it. Men are what their mothers made them." If this is true of heredity law, it is also true of influence, for the mother has it more within her power to mould the plastic mind and character of the child, than any other person in the whole world; and if she so wills it, the home influence may be salutary and ennobling; but if on the contrary she is indifferent and careless in this respect, caring more for the practical gains of life, than the happy and salutary influence of her home, she dwarfs and mars the character that might have been hers to beautify and exalt.

Good Cooking.—Not only the comfort but the health of the household depends much upon the manner in which the food is cooked. We believe more dyspeptics are made every year by poor cooking than any other cause, to say nothing of domestic discords that might be traced to this source. The manner in which an article of food is cooked, has far more to do with its healthfulness, or its being palatable, than the quality of the food itself. It is the duty of every housekeeper to acquaint herself with the best methods of cooking. Every girl should learn the practical and most approved mode of doing things pertaining to housekeeping, that whether she is obliged to do the work in her family or not, she will understand how it should be done, and be able to instruct her servants, and also to know how much labor to expect of them. A household whose table furnishings are entirely under the control of servants, with no direction from a more intelligent source, is indeed to be pitied, and a woman who feels above looking after the welfare of her own family in this respect, has a very narrow and false idea of the true dignity of her position as the head of the family, as well as the duties pertaining to it. One of the most common articles of food that is unskillfully made is bread. Good wholesome bread, which is regarded as the staff of life, is more rarely seen than is commonly imagined. Bread, as it is usually found, might quite as appropriately be denominated the "staff" of disease and death as "of life." Good yeast bread is too scarce an article of diet, and vile compounds with cream-tartar and saleratus or soda or baking

powder too commonly used as a substitute, because more quickly and easily made. Bread should be sweet, light, palatable, and wholesome; and when made of the proper materials, and in the proper manner, it will be such; but when made of poor flour, poor yeast, and allowed to over-ferment or sour before baking, or to be but half baked when taken out of the oven, it will not be a suitable article of food. Many housekeepers do not bake their bread and pastry sufficiently; hence, it comes upon the table in a half doughy state, that would seemingly be sufficient to cause dyspepsia to the strongest and most healthy digestive apparatus. When what goes into the stomach has so much influence in determining the health of the individual, no wife or mother should be indifferent or careless with respect to the quality or cooking of the food that is placed upon her table. Hers is the responsibility in this respect, and she should make herself thoroughly efficient either to perform or superintend, as circumstances require, the work that pertains to this most important department of household economy.

Adulteration of Food.—The subject of food adulteration is one of momentous importance to every household. The manufacture of spurious articles, and the adulteration of the genuine has become so common, that there is scarcely anything that is safe from this fraudulent practice. This evil has become so universal that it extends to drugs and medicine supplies, as well as food, and is employed in the manufacture of wines, lager, rum, brandies, and other alcoholic liquors to a fearful extent. Physicians assert that many valuable lives are sacrificed from the failure of adulterated medicines to secure the expected result. Nearly all of our groceries and spices are capable of adulteration. Much of the tea, in order to give it color and weight, is poisoned with prussic acid, mineral green, arsenite of copper, verdigris, clay, etc. The coffee that is bought in packages is rarely pure, but consists of various compounds mixed with a small proportion of coffee, such as peas, chickory, stale bread, etc. The writer once entered the grinding and packing department of an extensive wholesale coffee establishment, that had a good reputation for honesty, and there among other adulterants were barrels of mouldy bread that was being roasted in revolving cylinders and ground to mix with the coffee. Even flour is frequently adulterated with poisonous compounds, while the extensive use of glucose in our sugars, syrups, honey, confectioneries, etc., is asserted by medical authorities to be one of the principal causes of the great prevalence of Bright's disease of the kidneys, as well as some other diseases. Sugars and syrups are frequently bleached and clarified with some of the most poisonous substances, such as muriate of tin; and their bulk and weight are raised by ground stone, white clay, and other materials. Spices are adulterated with various substances, or have much of their oil extracted before being put upon the market; ginger with flour and meal; much of the butter found in the market is a compound of grease; while milk is rarely obtained pure from the dealers in this article. Vinegar is not all made from cider, but from different acids, and the glass washings and refuse beer preserved in beer saloons. Yeast powders are sold that contain soluble salts of aluminum, and other vile compounds. Pulverized alum is sold for pure cream-tartar, etc.

A recent authentic writer says on this subject: "The agreeable odor of caramel in the neighborhood of the coffee mills tells its own tale, and to explain the wonderful cheapness of the beautiful jellies now in such common use we should have to go further than our matutinal friend 'Rags-bones,' and pursue through the wonderful transformations worked by modern chemistry the bones from our garbage box, flavored and colored by the waste products from gas works, back again to our tables as currant jelly for our famous canvas backs and red heads, and perhaps meet in our sugar bowls our old shirts transformed into very palatable sugar."

Even the vessels in which our food is cooked, or put upon the market, are made of poisonous alloys; for instance, canned goods put up in tin cans. Tin vessels as generally found, are not made of pure tin, but a mixture of lead and tin. The lead is easily acted upon by the acids of fruits, vegetables, meats, etc., which is one of the most subtle and dangerous of poisons that can be taken into the system. While Great Britain, Germany, Belgium, and other European nations have enacted and enforced effective laws for the suppression of the sale of adulterations, in this country we may be said to be almost without legal protection in this respect, and the United States is made the market for the most part of such adulterants as are excluded from the principal markets of Europe. When our government employs a more efficient means of remedying the evil than is at present practiced, which can only be secured by the rigid system of inspection, and the punishment of every violation, we may hope to see an improvement in this respect, and human health and life be protected from the murderous process of slow poison administered in food and drink.

House-Cleaning, etc.—In the general care of the house, as well as in the semi-annual house-cleanings, much unnecessary labor and confusion may be avoided by observing system in performing the work, with regular times for doing it. If it be sweeping—sweep, dust, and arrange one room before removing the furniture from another for the purpose. The same rule would save much confusion in house-cleaning, except in case of whitewashing and painting; the carpets may have to be left up about the house, but whenever it is possible, clean and put in order one room before commencing another. This is much better than enduring universal chaos and disorder in a house for a whole month, as is frequently the case in some families each spring and autumn, at the regular recurring house-cleaning periods. Commence at the uppermost room, thoroughly cleaning one room at a time until the cellar is reached. Remove to another room all the furniture, as far as practicable; take down the pictures and carefully wipe the dust from them with a soft cloth, and convey to a safe place, leaning the faces against the wall for protection. Take down the curtains and lambrequins; hang the latter on a line and dust with a broom brush. Take up the carpet carefully and have it properly dusted. Don't permit it to be beaten with a thick, blunt stick, as this will be sure to break holes in it, and cut the stitches. Supple whips, or slender, fresh-cut switches are best for this purpose. Bits of damp paper, tea-grounds, or damp salt sprinkled over the floor before sweeping up the dust, will prevent its filling the air of the room. Sweep the dust up clean, then remove the remainder with a damp mop; there is no necessity of saturating the floor with water; wring the mop out frequently in clean water and wipe it over carefully.

Wipe the walls from top to bottom with a clean white cloth, making the strokes from the top to the bottom, changing the cloth often to prevent soiling. When the paper is gilded, or very delicate, it may be well to use a soft brush, or a cloth wrapped over a whisk brush or a common broom. Wash the paint in warm water, without soap unless very much soiled. For white paint, one-fourth skim milk with the water will make it look new and fresh. Hard soap is best when it must be used; soap will have a tendency to remove the paint, and whenever used the surface should be quickly rinsed with clear water and wiped dry. Common whiting or a little knife brick will aid in removing soiled spots. A little ammonia in the water is excellent for removing finger marks. Never wash varnished surfaces with soapy water. Powdered borax will make old yellow paint look white and fresh. To clean black walnut, wash off in clear water, rub dry, and then apply a little linseed oil on cotton and rub thoroughly, afterwards rubbing with dry soft cotton. Light woods, such as white ash or oak, require nothing but clear cold water and a soft cloth, afterwards polishing off with old soft flannel.

Windows should be washed with suds and rinsed with clear water if much soiled; if not, clear water will answer the purpose. Then quickly wipe dry with a linen cloth, and polish off with a piece of newspaper. The blinds should also be taken off and washed, or thoroughly dusted, or the first rain will be liable to wash the dirt from them on to the windows. If the carpet contains grease spots, remove them with benzine. In putting down carpets a wadded paper lining is a great saving and will last many years. If moths are troublesome, dust Pyrethrum powder around under the outer edges of the carpet. Carefully dust all the furniture, books, etc., before returning them to their proper places. A soft cloth duster is more serviceable than any other for wood work or books. When papering is to be done, always remove all the old paper before applying the new. A good step ladder is very essential in every house, especially in house-cleaning. In sweeping a room, remove all the chairs; and cover the sofa, table, and other articles of furniture that remain with something to keep off the dust. After the dust has had time to settle, dust carefully, not forgetting the rounds of the chair, and all the little nooks and corners in furniture where it will be sure to find entrance. In sweeping sleeping rooms, first make up the bed as usual, and cover the bed with a soiled sheet until after the dust from sweeping has well settled.

Glossy Starch.—Shirt bosoms, collars, and cuffs can be made to look glossy by the following method: Take two ounces of white gum arabic, and pour on it a pint of water, covering it to keep out the dust, and let it stand over night. In the morning strain it carefully from all sediment, put it in a clean bottle, and cork it up for future use. One tablespoonful of this water to a pint of starch, and a piece of white wax about the size of a small chestnut melted in the starch, will give a fine gloss when the polishing iron is thoroughly used.

Ironing.—"The secret of nice ironing is a clean, hot flat-iron, clean ironing cloths, and well-folded clothes. In ironing a shirt, begin at the binding of the neck; then fold the back

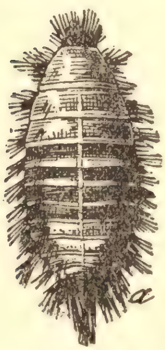
through the middle, and iron it; then iron the sleeves and the front of the shirt; last, iron the bosom on the bosom board; wet the bosom once with a damp cloth, and iron hard and quickly with a polishing iron.

Cuffs and collars are also ironed on the bosom board, as the shirt bosom is. A shirt collar should be ironed lightly first on the wrong side; then turn it over and iron hard on the right, until there is a high polish and it is perfectly dry. In ironing a skirt, slip it over the skirt board; have the clothes basket under the board, so that the skirt may not touch the floor. Iron the right side." Muslin, embroidery, and prints should be ironed on the wrong side; this gives them a much newer and fresher look.

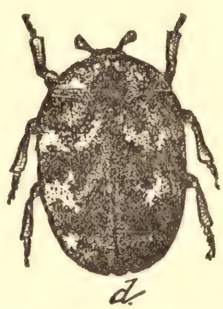
Washing Window Curtains. — Plain white window shades should never be run through the wringer, as the wrinkles thus produced cannot be easily removed. Wash clean, and starch rather stiff in starch that contains a little gum-arabic. Hang up dripping wet, and let them dry in this manner. Muslin and lace curtains should, of course, never be put in with the regular washing, as they are easily torn. They can be handled with much less danger if folded before putting them into the water. They should not be rubbed much, but put them to soak a few hours in strong soap suds. Squeeze the water through the meshes carefully with the hands, changing the water frequently. Starch and dry in the sun. Lace curtains should be stretched evenly and pinned to a sheet that is laid on a clean lawn, and fastened in some way at the corners, or the sheets may be pinned to a carpet in a room where they will not be dusted. Blue slightly, and put a little gum-arabic water in the starch, but never iron them. While drying, take pains to see that the edges are pulled out perfectly even and straight, as they will not hang well if they are not even when dry. We have seen nice lace curtains completely ruined the first time they were washed, from the ignorance of the washer, and have also seen them manipulated with such care during the washing process that they came out looking as fresh as when new.

Washing Prints. — To wash prints, delaines, and lawns that will fade by using soap, make a starch water similar to that made to starch prints with, and wash in two waters without any soap; rinse twice in clean water. If there is green, dissolve a little alum and put in the starch water.

The Buffalo Moth. — This moth has within a few years been very destructive, its destructiveness being particularly manifested upon carpets; hence it has been called the "carpet bug" or "carpet beetle." It works under the edges of carpets, making large holes near their margins. Where there are cracks between the floor boards, it will frequently follow these, and, by working along, cut off whole breadths of the carpet.



a, Buffalo Moth.



d, Buffalo Beetle (Magnified).

It will also eat woolen articles of clothing when packed away or hanging up, furs, feathers, etc., the same as the common house moth, but are vastly more destructive and more difficult to exterminate. The accompanying cuts show the moth and beetle considerably magnified. The moth is about three-sixteenths of an inch in length, and covered with long, brownish hairs, those at the sides being in tufts. The length of the beetle is about one-eighth of an inch. It is black, and rather prettily marked with bright brick red and white. The best means of killing this insect is to lay a wet, folded sheet along the edges of the carpet, and slowly pass hot irons over it, in order to produce all the steam possible, which, penetrating the carpet and cracks beneath, will kill the moth. Before carpets are put down it would be well to fill the cracks in the floor, and especially between the base board and floor (which is their favorite retreat), with putty or plaster of Paris. Where the cracks are small, hard soap may answer the purpose.

Selecting Meats. — Steer or heifer beef, when properly fattened, is the best. It is tender, has a fine grain, a yellowish white fat, and is firm in texture. When first cut, it will be of a dark red color, but after a few moments' exposure to the air it will change to a bright red. It will also have a juicy appearance; the suet will be nearly destitute of fibre, and appear dry and crumbly. Older beef, such as the flesh of the ox or cow, will seem coarser in texture, be darker in color, and less juicy.

The finest quality of mutton will be quite fat, the fat portion being white and hard, while the lean will be juicy and rather dark red in color. When there is but a small quantity of fat that is soft and yellow, and the meat is coarse and flabby, it is a sure indication of poor quality. Both beef and mutton are improved by keeping a while, when the weather will admit. The time will, of course, depend upon the climate, etc. Beef two or three weeks old, and mutton a week or more old, is much better, when it can be well kept, than that recently butchered. Lamb, being more juicy than mutton, will not keep as long. The size of the bones of a lamb will generally determine its age; they will also be reddish in color. Good veal will have flesh of a pinkish tinge, and the fat will be white and firm. Never buy veal that has soft flesh of a bluish tinge. It shows that the calf has been killed too young. The soft, cartilaginous state of the bones also shows this. When the meat looks white, it indicates that the animal was bled before being killed, which is not only a cruel and barbarous practice, but injures the quality of the flesh. Pork should be firm in quality, the fat white and hard, and the lean a pale reddish tinge. Pork that is soft, with yellow fat, is of poor quality.

Selecting Poultry. — Few people are as good judges of poultry as they ought to be. All fat fowls offered for sale in the market will not make fine, tender roasts. Every one knows whether poultry is tough or tender when it comes upon the table, and is subjected to the real test it there receives; but it is essential to be able to distinguish between the tender and the tough birds before they arrive at this point. In chickens, the lower end of the breast bone is soft and can be easily bent; in old birds, it is not as flexible. When the spurs on the hen are hard, and the scales on her legs rough, you may be assured that she is old, whether you see her head or not; but the head furnishes the surest indications of age. If the under bill is so stiff and hard that it cannot be easily bent down, and the comb thick and rough, she is old and tough, no matter how fat she may be. A young hen has a soft under bill, a thin, smooth comb, and only the rudiments of spurs; while the scales on the legs are smooth and glossy, and the claws tender and sharp. In selecting turkeys, the lower end of the breast bone should also be soft and easily bent. This denotes a young bird. An old hen turkey has rough scales on the legs, long, strong claws, and callous soles to the feet; while a young one is the reverse of this. An old turkey cock has a long tuft or beard, and a young one a very short one. When these are off, the scales on the legs and size of the wattles of the neck will determine the difference between old and young birds.

It is more difficult to judge of the age of a goose than any other fowl. One of the best tests is the brittleness of the windpipe. If this breaks easily under the pressure of the finger and thumb, the bird is young; if it rolls and does not break, it shows that the bird is old. Other indications of age are rough legs, thickness and strength of bill, tenderness of skin under the wings, and coarseness of the skin. The same tests that are applied to chickens and geese are applicable to ducks, but a young duck's bill is much longer in proportion to the breadth of its head than an old duck's. A young pigeon is known by its pale colors, smooth scales, tender feet, and the long, yellow down interspersed among its feathers. A pigeon that can fly is too old for use, being tough and dry. At this period they have red legs and no down.

Selecting Fish. — When fish is fresh, the eyes will be full and bright, the gills of a natural red color, the scales bright, the fins stiff, and the body firm. Never purchase fish that have dim, sunken eyes, dark-colored gills, or that are soft in flesh. No article of animal food will taint or deteriorate in quality so quickly as fish.

Selecting Groceries, etc. — The flour at present used is made by two different processes — the old or St. Louis, and the new or Haxall. The latter is designed principally for bread, and the former for pastry, cake, etc. The new process flour packs much more closely than the old; consequently a pound of it will not measure as much as the latter. The rule generally employed in recipes is to use but seven-eighths of the quantity of the new process, or one-eighth less than that of the old. Since the new process flour does not make as good cake and pastry as the old, and is designed more especially for bread, it is well to keep both kinds on hand. The best flour is generally the cheapest. Among sugars, the granulated is the most economical, since a pound of it, being dry, contains more sweet proportionately than that which is damp and more heavy. Avoid sugar with a blue tinge. Black tea is less liable to be adulterated with poisonous substances than green; yet even this is not always pure. By purchasing coffee in the berry, one is more likely to obtain a pure article than when obtaining it ground and ready for use.

Setting a Table.—There are various methods of setting a table, which vary according to individual taste in minor details, but the following will be found to contain hints suited to the wants of most households: "The table linen should be spotlessly white and changed frequently to keep it so. A piece of heavy Canton flannel put on smoothly under the table-cloth prevents hot dishes from injuring the table, besides improving the appearance of the linen. The table-cloth must be spread evenly, without wrinkles, the center fold being on the right side exactly in the middle of the long way of the table. Tray cloths under the tea or coffee service and the meat platter prevent the spoiling of the cloth, and are easily removed. Mats when used should be put on exactly straight and with regularity. Napkins should be laid directly in front of each plate. They must be often changed, and great care taken that to each person is given the one that he used before; napkin-rings are of use for this purpose. Fresh napkins should always be given to guests.

Knives and forks, glasses, in fact all small articles, should be carried to or from side-board or closet on a tray; never in the hand. Great care should be taken in putting each thing on the table exactly even, to give an orderly appearance to the whole. At each place on the right hand, put the knife, with the edge toward the plate; beyond that the spoon for the soup, and in front of both the glass; at the left, the fork with the tines turned up, also a butter plate. Or turn each plate upside down, and cross the knife and fork on it, the knife at the right and the fork at the left, with the napkin between. In front of the gentleman who carves should be put the carving knife and fork; and large spoons near dishes to be served. The coffee or tea service should be arranged in a semi-circle in front of the lady; the coffee or tea pot being on the extreme right with the handles turned toward the lady, and the cups and saucers at the extreme left. Be sure that the sugar bowl is filled before putting it on the table.

A caster, if used, is placed in the center. Salt and pepper casters, unless one for each place is used, should be put at the corners within easy reach. They should always be kept full, and ready for use. Butter balls are made with spadles dipped in cold water; they should be made some time before needed, and kept in the refrigerator. They may be in various shapes, and one placed on each butter plate just before the meal, or passed around in the butter dish. All the plates and dishes used for breakfast and dinner should be warmed excepting those used for salads and dessert. Great care must be used not to crack them by overheating. The extra plates, knives, forks, and spoons needed should be arranged on the side-table. The finger bowls with doilies under them are to be half filled with water, to which a little lemon or other extract may be added. The bread-plate and water-pitcher should be filled and ready on the side-table. Glasses should never be more than three-quarters full. It is better to take them on the tray when filling to avoid spilling the water. The ice should be cracked, and may be put in each glass or in the ice-pitcher. Glasses should be filled just before or just after the family are seated, and again as often as necessary during the meal without any questions.

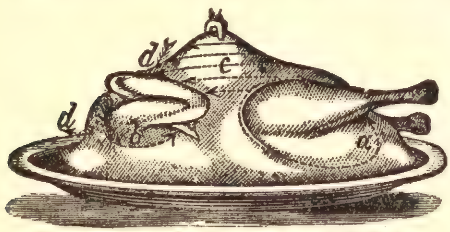
The place of the waitress is generally behind the lady, tray in hand; she should be ready to see, and quick to supply the wants of every one. While the meat is being served, she stands at the left of the gentleman to receive and pass the plates on her tray. Place things on the table at the right, but hand plates and dishes to the left of each person. Soup, clean plates, and finger bowls should always be set down before people at their right hand; other things should be passed to the left, so that they can help themselves. Vegetables, etc., should be passed to each one in succession on side dishes, beginning at the right hand of the host and serving him the last. Covers should be removed with the right hand and quickly reversed to prevent the moisture from dripping.

Remove soiled plates one in each hand. Never pile them up. Before serving dessert, take everything from the table except the fruit dish and glasses; collect with a fork and a plate very large pieces of bread; then with a crumb knife or brush and tray, brush the table, standing at the left of each person in so doing. Always replenish the glasses at this time. Coffee at dinner is served last, in small cups, from the side-table. There are few absolute rules for table-setting and serving. We describe one way, while there may be others equally good.

A person waiting on the table or door should always be scrupulously neat in her person and clothing. She should have long white aprons to wear while waiting at table or going to the door, and colored ones to use while doing her work. She should move quickly but gently, and always going the shortest way around the table. She must never speak unless spoken to, and should avoid listening to the conversation of those she is serving. In case of

accident or mistake, she must not get excited or try to explain, but quietly repair or remove traces of damage."

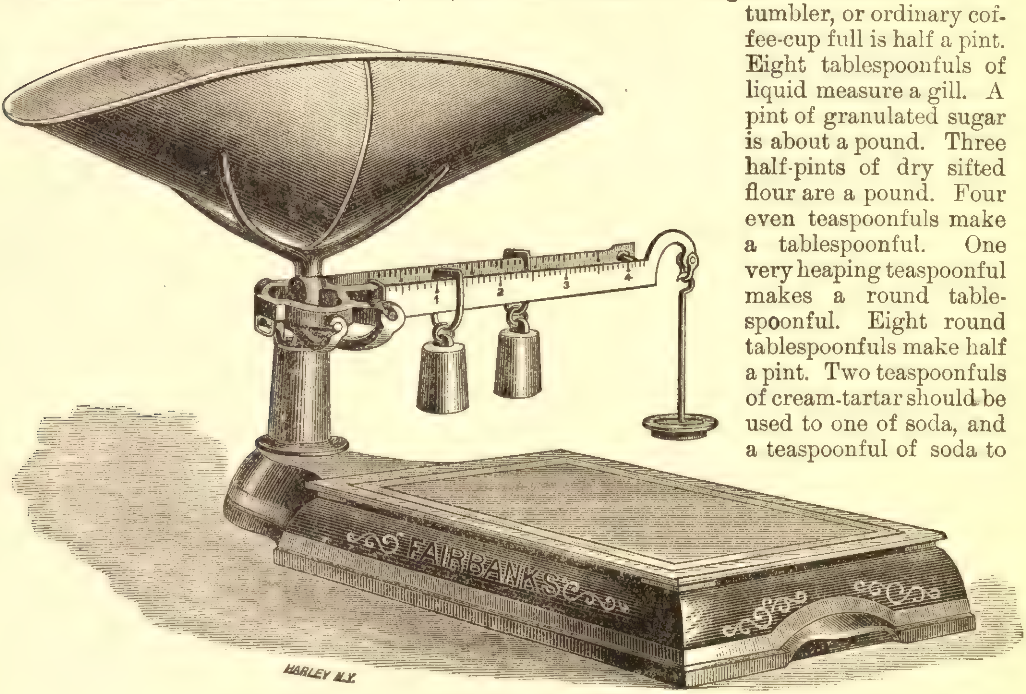
How to Carve a Turkey.—Among the many methods of carving a turkey, the following from a recent writer is perhaps as good as any that could be given in this connection. For a large company, a skillful carver places his fork in the bird, and does not remove it until the whole is divided, and in carving but one side all cutting should be done before taking out the fork. The turkey, having all strings and skewers used in trussing removed, is placed on the table with its head (or neck) at the carver's left hand. A skilled carver will not rise from his seat, but most persons find it more convenient to stand while carving. First insert the fork firmly, as indicated in the cut; then remove the whole leg and thigh by a cut shown at *a;* next remove the wing by a cut, as at *b*, letting these parts lie on the platter. Then cut downwards as many slices from the breast—the white meat—as there are persons to be served (as shown by the lines at *c*); then make an opening into the cavity of the bird at a place now hidden by the leg, for dipping out the dressing. Next separate the leg (drumstick) from the thigh, or second joint; the platter should be large enough to allow this to be done upon it, but if there is not room, a plate must be used. To hit the joint, notice the movements in an uncooked turkey; the separation is easily made with the right cut. The thigh, or second joint, should yield at least three portions; one with the bone, and two without, and a piece of this, with a slice from the breast served, unless some one is known to prefer a part of the drumstick—as many do—the thigh and drumstick will usually make three portions of dark meat, each; some prefer all white meat, and their liking, if not known, should be asked. Always lay the pieces outer, or skin side up, and add a small spoonful of dressing. Unless the preferences are known, it is proper to ask if dressing will be taken. There is a choice bit just below where the thigh is removed. known to many as the tenderloin, which is easily removed. The side-bone is removed by placing the knife in close to the rump and pressing it towards the head, when a thin plate of bone will come away with some choice pickings upon it. The wish-bone may be removed by cutting down from above, as shown at *d, d.* There is a side-bone to which the wing is attached, the removal of which is not difficult, but it cannot well be described. The wing gives one good cut, that nearest the body, and this may be served as white meat. If one side of the turkey is not enough for the company, the other is to be proceeded with in the same manner. The best way to learn to carve is to carefully watch an expert, and note his operations. A close examination of the turkey before it is cooked will help in giving a knowledge of the position of the joints.



CARVING A TURKEY.

RECIPES FOR COOKING, ETC.

WEIGHTS and Measures in Cooking.—Weights and measures are essential in cooking, besides being often a great convenience for other purposes; but it is some trouble for a housekeeper always to be obliged to weigh everything where the recipe indicates weight, and an approximate standard or rule for guidance will frequently prove of great utility. Of course spoons, cups, tumblers, and even pint and quart measures vary to a certain extent. It will, therefore, be well to verify your measures by a sure standard, after which they may be used instead of weights for convenience. A tumbler, or ordinary coffee-cup full is half a pint. Eight tablespoonfuls of liquid measure a gill. A pint of granulated sugar is about a pound. Three half-pints of dry sifted flour are a pound. Four even teaspoonfuls make a tablespoonful. One very heaping teaspoonful makes a round tablespoonful. Eight round tablespoonfuls make half a pint. Two teaspoonfuls of cream-tartar should be used to one of soda, and a teaspoonful of soda to a quart of flour. For mixed spices, a good proportion consists of three heaping teaspoonfuls of cinnamon to one of clove, and two of nutmeg, or one heaping teaspoonful of ground mace instead. A half teaspoonful of allspice may be added in mixing for spiced cakes or puddings. When a teaspoonful is indicated without qualification, a spoon rounding full is meant; by a cupful an ordinary breakfast cup holding about half a pint. A broken half pint cupful of butter weighs nearly half a pound, while a solid half pint cupful weighs a full half pound.



FAMILY SCALES.

Soups.—Of all the operations of cookery, none are more frequently neglected or of more importance than the preparation of soups. Soups of all kinds are wholesome, and may be made very palatable, to say nothing of their economy as an article of diet. To commence a dinner with a light soup is decidedly conducive to health, being easily digested and nutritious, and seems to obviate the danger of eating too heavily of solid meat. The making of soups is an easy and economical way of using waste pieces of meat, and the bony pieces that cannot well be utilized by other methods of cooking. The richest soups are made by boiling several kinds of meat together. The seasoning for soups may vary almost infinitely, various spices, herbs, and vegetables being used. A teaspoonful of vinegar added to beef soup improves its flavor. Two or three onions and one or two carrots cut into small pieces and boiled tender are frequently added instead of the flour. A teacupful of ripe tomato cut into thin slices also makes a fine seasoning. When convenient, it is a good plan to make a soup the day before except seasoning, and set away to cool, after which the fat may be easily

removed. The next day put the liquid into a stew pan and let it come to a boil, and afterwards season. Soups should always be served hot.

Barley Soup.—Cut half a pound of mutton into small pieces, reserving all the fat; put it into a stew pan and add a quart of cold water and two tablespoonfuls of barley. Let it boil slowly, just simmering. Put the bones, if there are any, into another vessel with a pint of cold water, let them boil one hour, filling up with water, if necessary, so as to have about a pint of the liquid, then strain the water into the kettle with the meat and barley, and cook slowly two hours longer. Season with salt and pepper to taste.

Beef Soup.—Allow one pound of meat to a quart of water. Cut the meat in small pieces, and break or saw the bones. Remnants of cooked meats, such as steak or roasts, may be used in this manner. Add cold water and let it come to a boil slowly, after which let it boil moderately three or four hours, or until the juices of the meat are extracted. Then strain it off and place the soup back in the kettle and add salt and pepper to suit the taste, with a little brown flour to thicken, rubbed up with butter.

Brown Soup.—Brown one tablespoonful of flour; then put it in a bowl with a small lump of butter. Stir together to a smooth paste, and add one-half a pint of boiling water with a slice of toasted bread cut into small pieces, and salt to taste. This soup is both palatable and nutritious; and when animal food is forbidden, may be used as a good substitute for richer soup.

Ox-Tail Soup.—A large tureen of soup may be made from two ox-tails if large, or three if small. Wash them clean (not allowing them to soak in the water). Divide them at the joints, and put them in a stew pan with three quarts of cold water. Let this boil slowly until the meat is quite tender, which will be from two and a half to three hours. Remove the bones, cutting up the meat into very small pieces. Season with pepper, salt, celery salt, butter, and add a small quantity of brown flour to slightly thicken. Four onions, a small bunch of parsley, and a carrot sliced thin are frequently added to the seasoning.

Tomato Soup.—One quart of tomatoes, two tablespoons of flour, one teaspoon of salt, one of sugar, a pint of hot water. Let tomato and water come to a boil; rub flour, butter and a few spoonsful of the tomato together; stir into the boiling mixture; add salt and pepper; boil all together fifteen minutes; rub through a sieve and serve with toasted bread. To prepare bread for soups cut in thin slices; butter well; cut into squares; place on a pan in a hot oven for a few minutes. These are nice to serve with any soup or broth.—*Miss Parloa.*

Vermicelli and Macaroni Soups.—Two pounds of lamb and one pound of veal, from which all the fat has been removed; cut into small pieces and add three quarts of cold water. Boil slowly until the meat is cooked in shreds. Season with celery salt, common salt, pepper, and a half-teaspoonful of Worcestershire sauce; adding a heaping teacupful of vermicelli, or broken macaroni, and boil half an hour.

Pea Soup.—Take a pint of split peas, and when carefully picked over and washed, put them into a pint of water, soak in morning; three hours before dinner put them into a pot with a quart more water and about half a pound of pork (less if you wish the soup not very rich), boil it steadily and be careful to stir it often lest it should burn. It may need more water before dinner, and can be made of whatever thickness you prefer. If you prefer to have the soup without pork, use the liquor in which the beef or other fresh meat has been boiled instead of water, and use no pork.

Turkey Soup.—Take the turkey bones and cook for one hour in water enough to cover them, then stir in a little of the dressing. A little chopped celery improves it. Take from the fire, and when the water has ceased boiling, add a little butter, with pepper and salt.

How to Broil a Steak.—First see that the fire is clear and not too much of it; open wide all the draughts, to carry off all the smoke that is made during the process of broiling; then see that the gridiron is smooth and quite clean, lay on your steak. Do not pound it, nor, after it is on the fire, stick a fork into it, or the juice will escape. Neither salt nor pepper it; do that on the dish. Throw a little salt on the fire, and put over the steak; place the gridiron close on the range for the first few minutes, to carbonize the surface, so that the juices will not escape, then turn it over quickly, to carbonize the other side. Now it should be exposed to a slower fire. The steak should be turned repeatedly and carefully, and when it feels rather firm to the touch it is rare, and if so liked it should be taken off, laid on a hot dish, on which one and one-half ounces of butter have been melted, less than one half tea-

spoonful of salt, a pinch of white pepper, and one teaspoonful of chopped parsley, well mixed; lay the steak on one side, and then on the other. Serve immediately.

Beefsteak Smothered with Onions.—Cut up six onions very fine; put them in a saucepan with two cupfuls of hot water, about two ounces of good butter, some pepper and salt; dredge in flour. Let it stew until the onions are quite soft; then have the steak broiled, put into the saucepan with the onions; then simmer about ten minutes, and send to the table very hot.

Beefsteak is very palatable when served with fried onions. Slice the onions thin, and put them into a kettle of hot fat consisting of meat drippings the same as for frying doughnuts. Let them fry until brown and tender; strain out with a skimmer, letting the fat drip out well; broil and season the steak as above recommended, and spread the onions over it. Fat used for frying onions should, of course, not be used for cooking anything else, as it will have an onion flavor.

To Brown Flour for Meat Gravies.—Sift the flour and put it into an iron pan on the stove. Stir it constantly, scraping it up carefully from the bottom, never allowing it to stick or burn in the least, as it will give it a bitter flavor. Stir it rapidly and move it as it darkens, in order to get it browned perfectly even. When of an even nice brown color it is done. A quantity could be browned beforehand, and kept for convenient use in a glass or tin can. This, when used for thickening, gives certain meat gravies and brown soups a good color and flavor.

Roast Meats.—Meats require a hot oven for roasting; it is better, however, to have the oven moderately hot for the first ten or fifteen minutes, and be made hotter until the heat is quite brisk, than to have it very hot at first. After the meat is heated through, the heat should be well sustained until it is done. For a piece of meat weighing six to eight pounds, put a pint and a half of water in the roasting pan, with a teaspoonful of salt. More water without salt should be added as this boils away. Wash the meat in cold water, not allowing it to remain in the water to soak, wrap a clean, dry cloth around it to absorb the moisture, and rub evenly with fine salt. Do not dredge the meat with flour until it is two-thirds roasted, but continue to baste it with the water and meat drippings to keep it juicy and prevent it from getting crisp and dry. In doing this keep the door of the oven open as short a time as possible so as not to lower the heat. A cloth wound loosely around the hand and wrist, or an old gauntlet glove will protect from burning. Turn the pan around, or the meat in the pan, as required for even roasting. When about two-thirds done, draw out the roasting pan partly from the oven, and dredge it thoroughly and thickly over with fine sifted flour. When the flour is well browned (not before) baste it thoroughly with the gravy, and dredge in the same manner with flour again. Repeat this flouring and browning three or four times, being careful not to wash off the flour before it is browned, and the meat crisp, or to leave any unbrowned flour when it is taken out of the oven. Do not permit the water in the pan to dry out, as this is intended for the gravy. There should be a full pint or more of it. When done, take out the meat on a platter and cover and keep it hot. Set the roasting pan on the stove and stir all the scraps and flour from the dredging into the gravy as it boils. If not thick enough, stir in a little more flour. If there seems to be an excess of fat on the top of the gravy, dip it off with a spoon into another dish, being careful to take only the fat, and add a little more boiling water, stirring rapidly all the time to have it of a uniform thickness. Browned flour is best for this purpose. For roast veal, remove the bone if it be a leg, and fill the space with dressing, or if a loin, put as much of it under the flap as can be pressed into the space, and the rest in the corner of the stew pan, or it may be baked in a separate dish. Two or three thin slices of salt pork laid on the veal before placing it in the oven, enriches and flavors the meat. It should be removed just before dredging. All meats should be well basted while roasting. For the gravy for mutton or lamb, a little mint is excellent for seasoning.

Dressing for Roast Turkey, Stuffed Veal, etc.—A pint of finely pounded cracker crumbs, or stale bread that has become dry and chopped fine may be used as a basis of the dressing of roast veal, turkey, chicken, etc., to which may be added a full half cup of melted butter, with salt, pepper, pulverized sage, and summer savory to suit the taste. It is better to mix the salt, pepper, sage, and summer savory with the dry crumbs before adding the melted butter, which should be evenly stirred in. Stir in enough boiling water to make it into a stiff dough, afterwards beat one egg very light and mix it in. The egg can be omitted without serious detriment to the dressing—in fact some prefer it without. A few

thin slices of salt pork chopped so fine as to be as readily mixed with the crumbs as butter, are sometimes used in part for seasoning instead of all butter. The dressing for a roast goose is prepared like that for a turkey, except an onion finely chopped is added. A dressing for a roast goose is also sometimes made of finely mashed potatoes instead of crackers or bread crumbs, but the latter is generally preferred.

Roast Turkey, Chicken, etc.—Dress carefully and wash thoroughly in water slightly salted, and wipe with a clean, dry cloth. Put the heart, liver, and gizzard in a small sauce-pan, and covering well with water boil until tender. Prepare a dressing as previously described, filling the cavity of the body and the breast with it. Draw the skin well over the neck and tie it tightly with a small cord. The opening in the breast and body may be closed if necessary with a short skewer or a few stitches. Pass a long skewer under the leg joint between the leg and the thigh, then through the body under the opposite leg joint in the same manner, pressing the thighs upward and close to the sides of the fowl, then wind a string across around the ends of the skewer, and fasten it tight. The wings should be trussed up in the same manner, which will give the bird a plump and compact appearance. Cross the ends of the legs, and fasten them down to the tail, or they may be held down with a short skewer. Roast according to the directions for roasting meats, baking with the greatest care, and turning to have it brown evenly. It should be well cooked through and nicely browned before being taken from the oven. From an hour and three-quarters to two hours will be required for a turkey weighing eight pounds, and ten to fifteen minutes should be added for every additional pound. Of course much depends upon the intensity of heat in the oven. When done, dish it, removing the skewers and strings, and in preparing for the oven place the roast pan on the range, chop very fine the heart, liver, and gizzard that have been boiled tender, and with the water in which they were cooked add to the gravy in the pan, stirring in more flour, if necessary, for thickening. Ducks and geese are prepared for roasting in the same manner as chickens.

Smothered Chicken.—Dress a good-sized chicken as for roasting. Cut it open in the back, and spring the breast-bone back so that it will lie flat on the roasting pan. Wash it in salt and water, lay it in the baking pan with the outside of the bird up; rub it over with butter well mixed with flour, cross the legs and tie them, and cramp the wings. Pour over it a quart of water and set it in the oven to bake, dipping the gravy over it occasionally. When well browned turn it over and sprinkle the under side with flour and set it back in the oven. About fifteen minutes before it is wanted for the table, turn it over again with the breast up and dredge with flour again, letting it bake till it has an even brown and crisp appearance. If sufficient flour and butter were used to dredge the fowl, the gravy will be just right to serve without additional flour; if not, a little should be added. This makes a delicious dish for either breakfast or dinner.

Baked Shad, Bluefish, Bass, etc.—Make a dressing or stuffing the same as for roast meats, and after removing the scales and head, dress and wash out clean, drying with a cloth. Fill the body with the dressing and sew it up. Lay the fish in a baking pan, and add water and salt the same as for meat roasts, with the addition of a little butter, the water in the pan being about a half inch in depth. Baste the fish often, not permitting the skin to blister or burn, keeping up the supply of water in the pan by additions. Cook fully an hour. About twenty minutes before it is done dredge with flour, letting it brown; then baste and dredge again two or three times. It should be nicely browned when taken out of the oven. Gashing the sides of the fish about an inch apart, and laying in a very thin strip of fat salt pork, is sometimes done to add to the seasoning. The gravy that remains in the baking pan is thickened with flour, with the addition of butter, pepper, etc.

Escalloped Oysters.—One quart of solid oysters with every particle of sand and shell removed. Drain off the liquor, strain it, and add enough hot water to make a full half pint. Prepare a heaping half pint of fine cracker crumbs, with sufficient salt and pepper added to season. Mix half a cup of melted butter evenly with the seasoned cracker crumbs. Butter a deep dish and put in a layer of crumbs and moisten them with a few spoonfuls of the liquid; then cover these with a layer of oysters, repeating alternately the layers in this manner until all are used, and having a layer of cracker crumbs on the top. Bake from three-quarters of an hour to an hour, or until it is nicely browned. It may be necessary to add a few small pieces of butter on the top if the crumbs there do not seem sufficiently rich. A little hot water may also be added with a spoon if it seems too dry.

Fried Oysters.—Select the largest oysters, drain off all the liquor, dip in rolled cracker crumbs, and fry in equal parts of butter and lard until they are brown. Another method is to dip them in beaten egg and then in cracker crumbs before frying.

Chicken Salad.—Cut into small pieces two quarts of boiled or roasted chicken, free from skin, fat, and bone. Add four tablespoonfuls of vinegar, one teaspoon of salt, and a little pepper to suit the taste. For a dressing take the yolks of three eggs boiled hard; make them, fine and add two table spoonfuls of oil, one scant tablespoonful of mustard, one of sugar, and just enough of the liquor in which the chicken was boiled to moisten the salad nicely. Chop one quart of tender white celery. Keep separate on ice until just before serving, stirring the celery and chicken together. Arrange on a platter and garnish with the white leaves of celery. Half lettuce and half celery is sometimes used instead of all celery.

Lobster Salad.—This may be made in the same manner as chicken salad except using the lobster instead of the chicken. Another method: Four eggs, one tablespoonful of sugar, two of butter, one of salt, two of vinegar, one of mustard; beat the whites of the eggs separately, and add last. Cook in a bowl set in a kettle of water, stirring until it thickens. When cold add cream enough to make as thin as boiled custard. Add salt and red pepper to the chopped lobster, also chopped celery and lettuce. Set on ice until time for serving.

Salmon Salad.—One quart of cooked salmon, two heads of lettuce, two tablespoonfuls of lemon juice, one of vinegar, two of capers, one teaspoonful of salt, one-third of a teaspoonful of pepper, one cupful of mayonnaise dressing, or the French dressing. Break up the salmon with two silver forks. Add to it the salt, pepper, vinegar, and lemon juice. Put in the ice chest or some other cold place, for two or three hours. Prepare the lettuce as directed for lobster salad. At serving time, pick out leaves enough to border the dish. Cut or tear the remainder in pieces, and arrange these in the centre of a flat dish. On them heap the salmon lightly, and cover with the dressing. Now sprinkle on the capers. Arrange the whole leaves at the base, and, if you choose, lay one-fourth of a thin slice of lemon on each leaf.—*Miss Parloa.*

Fish Chowder.—Four or five pounds of any hard, white fish; haddock, bass, cod, sword-fish; cut in small slices, and freed from bone and skin—Three or four slices of salt pork fried out, crisp, in the chowder kettle.—Two onions sliced and fried brown in fat.—Two or three more onions, sliced, raw.—Eight common-sized potatoes, boiled and sliced.—A dozen soft, or butter crackers, split. Take the fried onions out of the fat. Leave only fat enough to just cover, say *wet*, the bottom of the kettle. Put in a layer of fish; a layer of sliced potatoes; sprinkle some of the onion, both fried and raw, upon the potatoes; a "scatter" of pepper; a *careful* pinch of salt, as the pork will help to salt it; another layer of fish, potatoes, onions; the pepper and salt again; go on until the materials are half used, taking care to proportion the layers so that all may hold out together.

When half is used, scatter in a few small-cut bits or strips of the crisped pork, and cover with a layer of half crackers, inside down. Do the same when the remainder of the chowder is layered in, putting the split crackers over all. You may butter the crackers, or not, as you prefer. You may butter and *crisp* them, previously, if desired. These variations are points of taste. Cover once and a half deep with cold water, and set on where it will come to a boil. Boil gently and steadily one hour, keeping it where it will not burn. Pour in a cup of cream, and stir carefully, just before it is done. Having used salt very cautiously, taste and see if more is needed. Be careful also with pepper, and add that, if required. When you have not *cream*, it will certainly be well to butter the crackers. Use the best of the milk, at any rate.—*Mrs Whitney.*

Clam Chowder.—Same way. using clams instead of fish. Save all the clam liquor to help fill up with water in the kettle. Also, cut off the "*leather straps*," when you trim the clams, and put them, not in the chowder, but in a saucepan, with just enough water to boil them, by themselves Add the broth thus gained to the chowder before taking up. Heads, of course, have been thrown away. To *open* clams, wash them clean, put them in a large pan or pot, with enough boiling water just to prevent from boiling dry and burning. A couple of quarts are enough for a bucket of clams. Cover them closely, that the steam may be kept in. As soon as they are well opened, take them off. Fifteen minutes will *cook* them, for serving as plain boiled clams. Dish up, and help as they are, in shells. Season with pepper, as you eat them, with lemon juice or vinegar.—*Mrs. Whitney.*

Macaroni.—Break the macaroni in pieces two or three inches in length. Put in cold water and let it stand on the cooking range until it boils ten minutes. Drain off the water and put the macaroni in a rather deep dish well buttered for baking. For twelve sticks of macaroni one egg well beaten and one-half pint of sweet cream or milk should be added. If milk, add a small quantity of butter, salt to taste, and turn it over the macaroni. Have half a cupful of grated cheese ready and sprinkle over the top just before setting in the oven. Let it brown nicely and be placed on the table in the dish in which it was baked.

Sausages.—To twenty pounds of meat chopped fine add eight ounces of salt, and a half ounce of saltpetre; one half teaspoonful of black pepper to every pound of meat, and one and one-fourth cups of finely pulverized sage to every ten pounds of meat. A little clove or allspice may be added to suit the taste. The meat for sausage should be mainly pork, about one-fifth fat; of the lean meat a fourth lean beef might be used instead of all pork if desired. The meat may be put in cases or packed in pans and sliced off for frying. A little partially melted lard spread over the top will help preserve the meat longer. Keep in a cool place.

Codfish Balls.—Soak pieces of salt codfish over night in cold water. Boil five minutes, remove all the bones and skin, and chop fine. To one part of fish add two parts of finely-mashed or chopped potato—that is, the fish should equal one-third of the material. Add sufficient butter, salt, and pepper to season well. To a pint of the chopped fish there should be two-thirds of a cup of melted butter and three or four tablespoonfuls of sweet cream or milk. Mix evenly and make into little balls, which flatten to about two-thirds of an inch in thickness. Beat an egg and slightly moisten the surface of the balls with it. Fry to a golden brown in half butter and half lard, or pork fat.

French Fried Potatoes.—Pare the potatoes nicely, and cut into several pieces lengthwise, making six or eight pieces of large ones and quarters of small ones. Drop into hot fat and fry the same as doughnuts. Care must be used to have the fat *hot* when the potatoes are first put in and keep it so, or they will soak fat; but if properly cooked in this way they will come out a nice brown, with no objectionable amount of grease in them, and make a delicious dish. Skim out and season with salt just before putting on the table.

Cauliflower.—Pick off all the leaves, wash the head of the cauliflower in cold water, and put it into boiling water, with a little salt for seasoning. Let it boil an hour steadily, but not furiously, so as to break it. When done take up carefully with a skimmer, put it on a dish, and pour over it a sauce made of cream, melted butter thickened with a little flour or corn starch, and seasoned with salt and pepper.

Fried Onions.—Peel the onions and slice them thin. Drop into a kettle of hot fat and fry the same as doughnuts until tender and brown. Skim out, taking care to drain out the fat, and season with salt and pepper.

Mixing Dough.—The best way to mix bread or dough of any kind is with a common chopping knife. It can be done much more quickly and easily in this manner, and saves the trouble of having one's hands emerged in sticky dough. Never melt the lard for pie crust, but mix it with the flour when cold, and wet with cold water.

Wheat Bread.—One quart of sifted flour. Have ready half a cupful of yeast. Make a hollow in the middle of the flour. To three-fourths of a pint of moderately warm water add two teaspoonfuls of white granulated sugar. We regard bread as sweeter and nicer flavored if salt is omitted. Pour the warm water gradually upon the yeast and flour, mixing with a chopping knife by turning and cutting until it is well mixed, and will cleave off the chopping knife readily without sticking. Dredge the moulding-board with flour; put the dough upon it, and dredge the dough and hands also with flour. Mould carefully at first so as not to have it adhere to the hands, and continue it until the dough is of an elastic and springy consistency, and will not stick to the hands or fingers if pressed into it. Put it in a bowl and cover with a clean napkin to keep out the dust. In cold weather set near the stove; in warm weather, away from it until it rises. Be careful that it does not overferment. There is a point in bread rising that requires attention; if it goes beyond this point it will lose its sweet, delicate flavor, although it may not be really sour. It therefore requires careful watching. Experience alone will enable one to readily detect the proper condition of the dough. When sufficiently raised chop and work the dough, at first until it will not adhere to the chopping knife; then turn it upon the moulding-board, mould as before, and make into loaves. Let it stand in the tins until it is raised sufficient for baking. Bread should be

uniformly a fine light, and not coarse and spongy, or with occasional large holes. It should be well baked, not burned, but baked thoroughly through, the crust to be uniformly a light golden brown. On removing from the oven, rubbing the outside over with a small piece of butter will make the crust tender. Avoid adding extra flour at the last moulding, as this will have a tendency to produce heavy or hard streaks in the loaf.

Brown Bread. — Take equal quantities of Indian meal and rye bran, a half cup of yeast, three-fourths of a cup of molasses (for a large loaf), a half teaspoonful of soda, and an even teaspoonful of salt. Mix with lukewarm water to a stiff batter. Let it rise an hour, and then steam three hours, the same as for steamed pudding, taking care not to let the boiling cease after the bread is put in. Afterwards bake ten minutes, or sufficient to form a light brown crust.

Graham Bread. — For two loaves, or two dozen muffins, one pint of water or milk, a half pint of wheat flour, and a pint and a half of Graham flour, half a cup of yeast, and the same of sugar or molasses, one teaspoonful of salt. Mix thoroughly, and let it rise an hour. It will require baking an hour.

French Rolls. — Take bread dough raised for the last moulding, and work into it a little lard or butter, sufficient to slightly shorten. Roll out the dough about an inch thick, and cut out the same as for biscuits. Rub a little butter on about one-third of the upper part of each, and fold it over on to the other portion. Let them rise about an hour; then bake to a light brown. These are excellent for breakfast when warm, and may be warmed over by setting a tin of them a few moments in the oven.

Biscuit. — Take a quart of sifted flour; add a teaspoonful of salt, one teaspoonful of soda, and two of cream tartar. Mix it evenly with the flour, which sift again to render the mixing more complete. If baking powder is used instead, add three even teaspoonfuls of that, and mix in the same manner. Afterwards add a cup of butter, not melted, but finely broken up into small pieces. Chop the butter with a chopping knife into the flour thus prepared, mixing and chopping until it looks uniformly yellow, like meal. Keep it cool, so that the butter will not melt; if it clings in solid lumps, it will make the biscuit heavy. Mix it with a scant pint of sweet milk. Roll out, and bake in a quick oven. Water may be used in place of milk, but milk is best. This is also nice for strawberry, raspberry, or orange shortcake. Another excellent recipe for biscuit, where cream is plenty, is to use a quart of pure, sweet cream for mixing and shortening the above, instead of the butter and milk.

English Breakfast Cake. — One egg, one tablespoonful of butter, one and a half cups of milk, one and a half cups of meal, one-half cup of flour, one tablespoonful of sugar, a little salt, two teaspoonfuls of cream tartar, and one of soda. Bake quickly, and it will be as light and tender as sponge cake.

Lemon Pie. — To three-fourths of a cup of cream, add the well-beaten yolks of three eggs, a full half cup of sugar, the juice of one lemon, and the grated peel of the lemon. For the frosting, the whites of three eggs, and one-fourth of a cup of pulverized sugar. Beat quick to a froth, and as soon as the pie is done, turn the frosting over it, and set it back in the oven for two or three minutes to lightly brown.

Raisin Pie. — Boil one pound of raisins an hour, covered with water. Add the juice of one large lemon or two small ones, one cup of sugar, and two tablespoonfuls of flour. This will make three pies.

Cocoanut Pie. — Three eggs well beaten, a half cup of sugar, a half cup of grated cocoanut, and a pint of milk. Bake without upper crust, the same as custard pie.

Rhubarb Pie. — Peel the rhubarb stalks, and cut into thin slices; fill the pies, alternating with layers of sugar and rhubarb. A cup of sugar will be required for one pie, as rhubarb is very tart. A few raisins will greatly improve the flavor. Dust a little flour (about a teaspoonful) over the upper layer before putting on the upper crust. Turn the upper crust under the edge a little, and press the two together, to prevent the syrup from boiling out. For the same reason, also, cut a large opening in the upper crust.

Mince Pies. — There are comparatively few housekeepers who know how to make *good* mince pies, and there are few articles of diet that are so unpalatable as mince pies that are not properly seasoned. The spices used should be according to taste, a mixture of all are generally preferred, consisting of cinamon, clove, allspice, mace or nutmeg, and a very slight sifting of pepper. Considerable salt will be required to bring out the flavors. The

following recipe is taken from Mrs. Whitney's cook book. We agree with her that butter is better than suet for mince pies, as it gives them a better flavor; but instead of mixing the chopped apple with the seasoned meat as soon as chopped, we should first thoroughly cook it to a soft pulp.

"The proportions of the following recipe are given as a good basis. When these are mixed, taste, and judgment must decide if the quantity of any of the ingredients would better be increased. I have kept far within the average limits of the cook books in respect to spices, for I always prefer to leave something to be added, and I believe in subdued undistinguished flavors, rather than those at all exaggerated or pronounced. You may use either suet or butter in preparing mince-meat. I like the latter myself and it is far less trouble.

Whatever further moistening may be needed, after using what is given in measure below, may be made up with any syrup you may have left from preserved fruit, water with jelly dissolved in it, as you would prepare for a summer drink, or molasses and boiling water, mixed half and half. The vinegar-syrup from sweet pickle is nice to help out the mixture. Or you may boil some vinegar-syrup on purpose,—equal measures of sugar and cider-vinegar. Just make the whole liquid mixtures a pleasant counteraction of sweet and sour, the *bright* taste prevailing. Be sure that there is salt enough to bring out all the other flavor. Often, when a higher flavor seems necessary the apparent tameness is only a deficiency of this. Salt may be used to the verge of *tasting* salt; never beyond.

Make ready,—at a convenient time beforehand,—for every two pounds of meat: Two pounds of fine raisins, stoned, and cut with a clean pair of scissors into bits, about three each.—One pound of dried currents, thoroughly washed, dried, and picked over.—Half a pound of citron cut in slips.

Make ready,—the day before you make your pies: A good fresh beef tongue, washed; put on in boiling water with a handful of salt in it, and boiled till perfectly tender. Try it with the knitting needle. When done, take it out, skin it, and return it to the hot liquor. Let all grow cold together.

If you use suet, take one pound to two of meat, pull off all the thin membrane, separating and picking over the pieces of suet thus detached, and chop it, in a cool place that it may not grow cloggy by melting, until it is as fine as dust. Set it away to keep cool till the meat is ready.

When the meat is cooked and cold, trim away from it all gristle and poor unpalatable parts, with bits of bone, about the roots. Weigh, of the nice selected portion, whatever quantity you wish to make into mince. I am giving measures of other ingredients suited to two pounds of meat, which will make as much mince, when all put together, as would ordinarily be worth while to prepare at one time. Chop this meat just as fine as you can. Now mix it thoroughly with the powered suet. *Or*, if you use butter instead, take a *short weight* pound for two pounds of meat, or measure a pint of broken butter, in pieces small enough to lie fairly close, but not packed. Melt it, stirring it till it liquefies. Then mix it with the chopped meat.

A fine housekeeper tells me, as I read this over to her, that a piece of nice salt pork perfectly fat, boiled about an hour to take away the rawness, and chopped fine, is an excellent substitute for suet. In chopping, put a little of the chopped meat into the tray with it to keep it from clogging.

Take four heaping tablespoonfuls of mixed spice.—Two heaping tablespoonfuls of salt.—Four heaping cups of brown sugar.—Grated rind of four large lemons. Mix well together, and all with the chopped meat. Take juice of the four lemons.—Two cups of molasses.—Two cups of boiled cider.—One cup of brandy, and one of wine.* Mix these together, and well into the mince meat.

Lastly, stir in your fruit, one kind after another, raisins, currants, citron, till all is equally mixed. Do all this stirring with your hand. Pack the mince into a bowl or jar, cover tight, and set away till the next day. Make ready, the morning of your pie-making, enough apple, chopped into jam, to measure twice as much as the chopped meat. Mix, with your hands, apple and meat thoroughly together. Now, if necessary, add moistening, according to suggestion in preliminary paragraphs. Make the whole as soft and moist as an easily stirred—not watery—sauce. Taste carefully, and see that salt and sugar are right, and use your own discretion as to increasing or modifying flavors. Remember the injunction in regard to flavoring soups: *Every condiment should hide itself, and help all the rest.* Make

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*Equal measure of some spicy fruit and vinegar-syrup, as suggested above, will quite well substitute these two last,—be more economical, and less open to objection. Sweeten accordingly.

your crust by directions for best pastry. Fill and make up your pies the same as apple pies. Bake the crust handsomely; the meat is already cooked; and if the apples are mellow, juicy, and well chopped, they will be done also." Material for mince pies can be canned and kept for future use the same as fruit, if desired.

Summer Mince Pie.— Four large crackers rolled fine, one and one-half cups of sugar, one cup of molasses, one cup of vinegar or boiled cider, one cup of water, two-thirds cup of butter, one cup chopped raisins, two eggs beaten and stirred in the last thing, and spice to taste. Put some whole raisins on top of the pie before putting on the crust.

Boiled Cider Pie. — Take four tablespoonfuls of boiled cider, three tablespoonfuls each of sugar and water, two tablespoonfuls of flour, and one egg; beat all together. Add a few raisins. Bake in a deep plate, and with upper and under crusts.

Queen of Puddings. — One pint of nice bread crumbs, one quart of milk, one cup of sugar, the yolks of four eggs, the grated rind of one lemon, a piece of butter the size of an egg. Baked like a custard. When baked, spread over the top slices of jelly of any kind, and cover the whole with the whites of the eggs beaten to a stiff froth, with one cup of sugar and the juice of the lemon. Brown lightly in the oven.

Steamed Pudding. — Two-thirds of a cupful of chopped suet, rubbed into three cupfuls of flour, two-thirds of a cupful of molasses, one cupful of raisins, one cupful of sour milk, and one teaspoonful of soda; steam three hours. To be eaten with any sauce.

Cottage Pudding. — One coffee cup of sugar, one tablespoonful butter, two eggs, three cups flour, one cup milk, two even spoonfuls of cream tartar, one even spoonful soda. Bake like cake, and serve with sauce.

Sauce for Steamed or Cottage Pudding. — Two cups of water, one tablespoonful of butter, one tablespoonful of flour or corn starch blended with the butter, two-thirds cup of sugar, one tablespoonful of vinegar or sour wine. Flavor with lemon, vanilla, or nutmeg to taste. Let it come to a boil, and stir in the wine or vinegar and flavoring as it is turned out.

Snow Pudding. — One-half a package of gelatine, soaked in cold water for half an hour; afterwards turn off the water, and turn a cup of boiling water over the gelatine, stirring it rapidly till it is all dissolved. Squeeze the juice of one lemon into it, and strain it to take out all undissolved pieces of gelatine. Beat the whites of three eggs to a stiff froth, the same as for frosting, adding one cup of pulverized sugar; also add the dissolved gelatine, when perfectly cold, at intervals while beating. This pudding requires beating a long time, which should be continued without intermission until it will not fall out of the dish when turned over. Put in molds and set on ice, or in a cold place to harden. If kept cold while being beaten, it will come to a stiff froth much sooner.

Sauce for Snow Pudding.—The sauce for snow pudding should be made of the yolks of three eggs made into a soft custard and flavored with vanilla or lemon extract.

Bird's Nest Pudding.—Pare tart apples sufficient to fill a pudding-dish. Make a batter of one quart of milk, three eggs, two cups of flour. Pour over the apples, and bake in a quick oven. Eaten with a sauce.

Blanc Mange, or Corn Starch Pudding.—Four heaping tablespoonfuls of corn starch, the same quantity of sugar, and one quart of milk. Dissolve the corn starch and sugar in a small quantity of milk to prevent its being lumpy. Scald the milk and stir in the corn starch batter rapidly until it is well cooked to prevent lumps forming. Add a dessert spoonful of lemon or vanilla extract, and turn into moulds to cool. Keep in a cool place until wanted for the table. Serve with sugar and cream.

Tapioca Pudding.—One teacup of tapioca soaked over night in water. One quart of sweet milk, one cup of sugar, one-half cup of raisins, the yolks of four eggs, and a pinch of salt. Flavor with lemon, bake one hour, beat the whites of four eggs to a froth with two tablespoonfuls of pulverized sugar, and turn it over the pudding after baking, then set it in the oven a few minutes to lightly brown.

Sponge Cake.—Four eggs, one cup of sugar, two teacups of flour, two teaspoonfuls of cream-tartar, and one of soda; or three teaspoonfuls of baking powder, if that is used instead. Beat the eggs and sugar, add the cream-tartar and soda to the flour, mix it well

and sift it again. Beat all together, and add vanilla or lemon extract for flavoring. Then add two-thirds of a cup of water the last thing, and beat thoroughly, turn into a well buttered dish, and bake in a quick oven.

Grinnel Cake.—One and one-half cups of sugar, two and one-half cups of flour, one cup of sweet milk, one-half cup of butter, two eggs, one teaspoonful of soda, and two of cream-tartar. Beat the eggs and sugar, adding the milk and flour afterwards. Divide this mixture, half and half. Flavor the light part to suit the taste; with the other part one cup of chopped raisins, and one full teaspoonful each of cloves, mace or nutmeg, and cinnamon. Bake separately in the same sized tins, frost both loaves, and place the light colored loaf on the dark one while the frosting is soft. This is very nice.

Loaf Cake.—Three cups of milk, and one of yeast; make a stiff batter and let it rise very light; then add two cups of sugar, one and three-fourth cups of butter, two cups of raisins and two eggs, with spices to suit the taste. Mix thoroughly and put in well buttered tins to rise again before baking.

Silver Cake.—Two cups of sugar, one-half cup of butter, three cups of flour, one cup of sweet milk, the whites of three eggs, one teaspoonful of soda, and two teaspoonfuls of cream-tartar. Flavor with lemon extract. This makes two loaves.

Gold Cake.—The same as the above, using the yolks of the eggs instead of the whites. Flavor with vanilla.

French Cake.—One cup of sugar, one-third cup of butter, one cup of sweet milk, one and a half cups of flour, one egg, two teaspoonfuls of cream-tartar, one teaspoonful of soda. Flavor with extract of lemon or vanilla.

Jumbles.—One and a half-pounds of flour, one pound of sugar, one-half pound of butter, four eggs. Mix the sugar and butter, then add the eggs and flour, and a little sweet milk if the eggs are not sufficient. Roll out and bake in a quick oven.

Fruit Cake.—One a half-cups of butter, three cups of sugar, four and two-thirds cups of flour, one cup of milk, six eggs, two teaspoonfuls of cream-tartar, one of soda, one teaspoonful of nutmeg, two of cinnamon, and one each of cloves and allspice. Two pounds of chopped raisins, two pounds of currants, and one-fourth pound of citron. This makes two loaves.

Another recipe considerably richer: One pound of flour, one pound of butter, one pound of sugar, ten eggs, three pounds of stoned and chopped raisins, one pound of currants, one pound of citron, two nutmegs, two full teaspoonfuls each of cloves and other spices, one teaspoonful of saleratus, and about a gill of molasses.

Snow Cake.—Two cups of fine granulated sugar, one cup of butter broken into small pieces, one even cup-full of flour, and four tablespoonfuls of corn starch sifted together, whites of twelve eggs, juice of one lemon. Flavor with two tablespoonfuls of rose-water, one teaspoonful of lemon extract, or half a teaspoonful of essence of bitter almonds. Beat the butter and one-half of the sugar together, then beat the whites of the eggs to a stiff froth, adding the rest of the sugar; drop the butter and sugar into the flour, turn the eggs and sugar upon it and beat thoroughly. Bake in a quick oven. Flavor the icing with rose-water or lemon.

Angel Cake.—The whites of eleven eggs, one and a half-cupfuls of granulated sugar, one cupful of pastry flour, measured after being sifted four times; one teaspoonful of cream-tartar, one of vanilla extract. Sift the flour and cream-tartar together. Beat the whites to a stiff froth. Beat the sugar into the eggs, and add the seasoning and flour, stirring quickly and lightly. Beat until ready to put the mixture in the oven. Use a pan that has little legs at the top corners, so that when the pan is turned upside down on the table, after the baking, a current of air will pass under and over it. Bake for forty minutes in a moderate oven. Do not grease the pan.—*Miss Parloa.*

Sunshine.—This is made almost exactly like angel cake. Have the whites of eleven eggs, and yolks of six, one and a half-cupfuls of granulated sugar, measured after one sift; one cupful of flour, measured after sifting; one teaspoonful of cream-tartar, and one of orange extract. Beat the whites to a stiff froth, and gradually beat in the sugar. Beat the yolks in a similar manner, and add to them the whites and sugar, and the flavor. Finally sift in the flour, mix quickly and well. Bake for fifty minutes in a slow oven, using a pan like that for angel cake.—*Miss Parloa.*

Icing and Ornamenting Cake.—The following directions on this subject are given by a writer in one of our leading Agricultural Journals, and will be found useful to many housekeepers:

The Icing.—"Whatever the decoration, the cake has first a coating of plain icing as a foundation. This preparation is merely the white of eggs and powdered sugar beaten together; as eggs differ in size, and as the temperature has an effect on the icing, no rigid rule can be given. It should be of a consistence that can only be learned by practice; it should not be thin enough to run, nor should it be so thick that, on standing, the surface will not settle and become smooth. The usual rule is: One pound of powdered sugar to the whites of four eggs; if lemon juice or extract of lemon or vanilla is added for flavoring, more sugar will be required to make up for this added liquid. The whites being placed in a shallow bowl, a little sugar is added, and the two are beaten with a whisk or egg-beater, the beating is kept up regularly, adding the sugar by degrees. If the eggs are large three will be enough for a pound of sugar. The beating and addition of sugar must go on until the icing is of the right consistence—and only experience and judgment can decide what the proper stiffness is.

To Apply the Icing.—The inexperienced should wait until the cake is cold, but those who are skilled apply the icing while it is still quite warm. The side of the cake is iced first; a piece of card-board, not too coarse and stiff, but about like Bristol-board will be required, as this may be curved to suit the surface of the cake; it should be about four inches long, and of convenient width to handle; the icing is to be applied to the sides with a knife, and smoothed and spread evenly by the use of the card-board, carrying the icing well up to the edge. For the top, place what may be required in the centre and spread it down towards the edges, by means of the card board; if the icing is very stiff it may need to be smoothed by the use of a broad-knife dipped in water.

Ornamentation.—The materials used for ornamenting the surface are of two kinds: 1. The icing itself; and, 2d, sugar paste, to be presently described, from which ornaments not possible with icing may be made to be attached to the surface.

The Use of Icing depends upon the skillful direction of a small stream of the material; syringes are sold at the furnishing stores for this purpose, but the regular decorators use a very simple affair. A coil is made of stout, well-glazed writing paper, like a confectioner's or grocer's horn, or cornucopia; this should be made very narrow at the point, and the paper go around two or three times. A quantity of the icing is placed in this, and the top edges are folded over; of course a pressure upon this will force the icing out at the point below, and great care must be taken to regulate the size of the hole there; the point is made purposely long, and by cutting off a bit of the paper at the end, the opening may be gradually enlarged. One of the commonest ornaments is the 'drop.' Squeeze out enough icing to form a drop, say the size of a pea, touch this to the iced surface of the cake, and lift the horn, and it will leave a neat drop. By squeezing gently the top of the horn, a continuous stream will be forced out; this may, by moving the horn along, be laid straight, or by giving it a regular side to side motion it will form a waved line. By giving the stream an up and down motion, scallops will be the result.

By combining these simple elements, the drop, the straight line, the waved line, and what we may call the furrowed line, a great variety of ornaments may be made, in the hands of an ingenious person all that may be desired in a home product. The line may be run to form a great variety of figures, such as hearts, leaves, initials, and monograms, etc. A very simple, but quite effective border may be made by the waved line run all around the edge of the cake, and a drop placed in each curve. By having two horns, one having a larger and the other a very fine stream, very pretty effects may be produced. Suppose a heart or a star has been made with the larger stream, then take the other, which should have a very fine point, and give a thread-like stream, and run lines across within the figure, very near together, in one direction, then cross-wise at right angles; this will give the effect of lace-work. Some times the whole surface of the cake is covered with lace-work in this manner, and the larger figures laid over it.

Precautions to be noted.—Have the icing so stiff that when it runs out of the horn it will retain its shape. In using the horn always press from the upper part downwards; as the icing is used up the top of the horn may be rolled down towards the point. Recollect that it is much easier to enlarge the hole at the point, than to contract it. Try first any new design upon a piece of clean paper.

Ornaments with Sugar Paste.— The paste is a sugar dough, made with powdered sugar and mucilage of gum tragacanth. To make the mucilage, take an ounce of the whitest gum tragacanth, and pour over it a pint of boiling water. Let this stand in a warm place, occasionally stirring, for a day. Tragacanth does not *dissolve*, it only swells to a paste; if not thin enough, add more boiling water and stir. The lumps must be strained out by squeezing through a coarse fabric. Use this strained mucilage and powdered sugar, mix and beat together—a mortar would be convenient, but it may be done on a moulding board, with a plenty of powdered sugar to keep it from sticking—as much sugar as a given quantity of the mucilage will take up and form a stiff dough that can be rolled out thin. From this dough or paste, by means of cutters, formed of strips of tin bent to the desired shape, leaves, parts of flowers, or other ornamental forms may be cut; this may be formed and moulded into any desired shape, and the raw material from which the most elaborate ornaments are fashioned. These ornaments may be attached to the surface of the cake with little of the mucilage, or where there is a flat surface, by merely wetting them; parts of the paste ornaments may be joined to one another in a similar manner.

Do not roll out any more of the sugar-paste than can be used at once, for as soon as dry it is as brittle as glass, and very hard. Keep the mass covered with a damp cloth. Have a definite idea of what is to be made, so that the paste ornaments can be put into shape quickly, before it dries. The surface of leaves, etc., may be figured at will by drawing veins, etc., upon it with some hard blunt point. Those who understand making wax or other artificial flowers, can fashion this paste into a great variety of forms. We have not provided for any colored or gilded ornaments sometimes used on cakes, as pure white throughout is much more pleasing to persons of taste."

Ice Cream.—Ice cream can be made in various ways with or without cooking the milk and eggs, also with sweet cream or without. Of course the richest is where the pure cream is used. That which is made into a soft custard before freezing is much the finest grained, and nicest. The following is an excellent recipe: Two quarts of rich sweet milk (part cream preferred), beat six eggs to a froth, the same as for custard, and add a cup of granulated sugar, mix it with the milk, and set the vessel containing it in a larger one containing water; stir constantly until it begins to thicken, but not to separate the whey. Take off and when cold add two teaspoonfuls of lemon or vanilla; then freeze, stirring rapidly to have it freeze evenly and make the grain fine.

Velvet Cream.—Two-thirds of a box of gelatine soaked in cold milk until it is soft. Scald a pint and a half of rich milk (part cream is better) in a double boiler, and turn the gelatine and milk into it, stirring rapidly. After the gelatine is all dissolved, stir in half a cup of sugar. Take from the fire and beat it very light; as the cream cools add a teaspoonful of vanilla or lemon extract. Beat the whites of three eggs to a froth, the same as for frosting, and when nearly cold beat in with the cream till it is all of an even froth. Then turn into wet moulds and put in a cool place to harden.

Soft Custard.—One quart of milk, one scant half teacupful of sugar, half a teaspoonful of salt, five eggs, one teaspoonful of lemon or vanilla extract. Beat the sugar and eggs together and add the milk and salt. Put it in a vessel and set it in another of hot water (or use a double boiler). Stir rapidly until it begins to thicken. Do not let it separate into curd and whey, but take it off just before it comes to this point. When cold add the flavor. Serve in custard glasses.

Jellies.—An ounce and a half package of Coxe's Gelatine makes three pints of water, fruit juice, or any other jelly. A package of gelatine measures a gill and a half, or about six round tablespoonfuls. When sea moss is used, a full tablespoonful will make a quart of jelly. One cupful of sago or tapioca will make a quart of jelly. Three tablespoonfuls of arrow-root or corn-starch will make a quart of jelly. Allowance should be made for wine, lemon juice, etc., used, and be deducted from the quantity of water used.

Lemon Jelly.—Soak a package of gelatine in a pint of cold water until it is softened to a jelly consistency, which will take from half an hour to an hour. Grate the rind and squeeze the juice of three good sized (four of small) lemons, add a scant teacupful of granulated sugar to the lemon juice and grated peel. Pour a pint and a half of boiling water to the lemon and sugar, and quickly add the softened gelatine. Stir until the gelatine is all dissolved, then strain it through a cloth strainer into moulds or a bowl to cool. Set on ice or in a cold place to harden.

Orange Jelly, Strawberry Jelly, etc.—Any fruit jelly for immediate use, such as lemon, orange, strawberry, raspberry, etc., can be made similar to lemon jelly, as previously given. Except when oranges are used, the juice of one lemon should be added, if the oranges are sweet; and in strawberry jellies, etc., the juice of the fruit is used for flavoring. Three pints of ripe strawberries, a box of gelatine, a pint of boiling water, and a half pint of cold water, and sufficient sugar to sweeten to taste are required. Soak the gelatine in cold water as directed for lemon jelly, mash the berries with the sugar (about a pint, according to the acidity of the berries), and let them stand two hours. Pour the boiling water on the crushed fruit and sugar; press the juice from the berries and add it to the dissolved gelatine, stirring it well. Strain through a napkin, and pour into moulds to harden, that have been set in cold water. If the strawberries are very sweet, it will improve the flavor to add the juice of a lemon.

Charlotte Russe.—One-half pint of thick cream whipped to a froth, the whites of two eggs beaten to a froth, one cup of water with two spoonfuls of gelatine dissolved in it; sweeten to taste and flavor with vanilla or lemon. One loaf sponge cake, take a deep dish, line the dish with small strips of this cake, and pour the cream into the middle of the dish, put writing paper on the bottom of the dish. Let it remain until hardened; turn it out on a flat dish.

Floating Island.—Make a soft custard and let it get cold. Beat the whites of three eggs to a stiff froth, adding a third of a cup of pulverized sugar. When the custard is perfectly cold, turn the frosting over the custard.

Sugar Kisses.—Whites of two eggs, beaten as for frosting; one cup of sugar added to them. Mix well, add a teaspoonful of any kind of flavoring desired, and drop in small cakes on a buttered tin. Bake in a moderate oven until lightly touched with brown.

Chocolate Cream Drops.—One cup of water, two of sugar, a pinch of cream of tarter; boil ten or fifteen minutes; beat it into a cream; let it cool a little, and then roll up into balls any size you wish, then place them on a thick paper to cool a little more; melt one-quarter of a pound of chocolate, and dip the balls into it while hot, then place them on a paper to cool.

Ice Cream Candy.—Two pounds of coffee-crushed sugar, one pint water, two tablespoonfuls of vinegar, a pint of butter; boil, but do not stir. When done enough to harden in water, add one teaspoonful of vanilla. Cool a little in plates, then work as molasses candy till white.

Chocolate Caramels.—One cup each grated chocolate, sweet, fresh milk, molasses, and brown sugar, a piece of butter the size of an egg; boil until it drops hard; pour it into a buttered pan, and before it cools mark it off in squares.

Cocoanut Dessert.—Place a layer of sliced oranges in a deep dish, sprinkle over with fine white sugar, then a layer of finely grated cocoanut; alternate orange, sugar, and cocoanut until the dish is full, heaping the cocoanut on top.

Canning Tomatoes.—Select perfectly ripe tomatoes, pour boiling water over them. When scalding them do not allow them to stand any longer in the hot water than is necessary to have the skin peel off easily. Peel as soon as possible after scalding, and quarter (not slice) them into a vessel, to stand an hour or so before canning. Drain off all the surplus water, as it is this liquid which causes so many tomatoes to become sour after canning. Boil them until they are cooked through perfectly; then fill the cans full—the cans having previously been heated with hot water—put on the covers quickly and turn them down tight. When perfectly cold, turn the covers down still tighter, if possible.

Pickled Cucumbers.—The cucumbers should be small, not more than two or three inches in length. Put them into a tub with a layer of salt and cucumbers alternately. Turn on boiling water and let them stand ten or twelve hours. Take out from the salt water, and turn boiling water over them, letting them stand till the water is cold; then take out and put in a jar, and cover with vinegar. Pickles prepared in this manner will be crisp and brittle, and require no alum or other injurious substances to make them so.

Tomato Chow Chow.—Slice one peck green tomatoes, six green peppers, four onions; stir in a cup of salt, and let them remain over night. Then pour off the water, put them in a kettle with vinegar enough to cover them. Add one cup of grated horse-radish, one tea-

spoonful of cloves, one tablespoonful of cinnamon, one tablespoonful of allspice, one cup of sugar; cook until soft.

Tomato Catchup.—Eight quarts of strained tomato, six tablespoonfuls of black pepper, six tablespoonfuls of salt, four tablespoonfuls mustard, one tablespoonful ground cloves, one tablespoonful yellow ginger, one quart vinegar, one-half cup of brown sugar, one tumbler of brandy. Boil very slowly until the quantity is reduced nearly one-half. Put into bottles.

Spiced Currants or Blackberries.—Seven pounds currants, four pounds sugar, one pint vinegar (if of average strength), one tablespoonful of cinnamon, one tablespoonful of cloves, one teaspoonful allspice. Give it two hours or more slow boiling.

Blackberry Wine.—Mash the berries and pour one quart of boiling water to each gallon; let the mixture stand twenty-four hours, stirring occasionally; then strain and measure into a keg, adding two pounds of sugar to each gallon. Let it stand until done fermenting; then cork it tight, or draw it off and bottle. Another good recipe for blackberry wine is as follows:—Measure the berries and bruise them. To every gallon add one quart of water, and let the mixture stand for twenty-four hours, stirring occasionally; then strain off the liquid into a cask, adding two pounds of sugar to every gallon of the mixture. Let it stand till the following October, when the wine will be ready for use without further straining or boiling. It may be improved, and perhaps kept better, by adding a small quantity of pure French brandy.

Elderberry Wine.—To every quart of berries add one quart of water; boil half an hour; run off the liquor and break the berries through a hair sieve; then to every quart of juice add three-quarters of a pound of sugar; boil again one quarter of an hour with ginger, and a few cloves. When sufficiently cool pour into a barrel with a cup of yeast and a piece of toast to assist the fermentation (to be kept in a warm place). When it ceases to hiss, add one quart of brandy to eight gallons of the liquor; then close the barrel perfectly air-tight and keep in a cool place for six months, when it will be fit to bottle. Another for elderberry wine:—To one gallon of the ripe berries add one of water; let it stand twenty-four hours, stirring it often; boil it half an hour in a copper or brass kettle, and strain through a sieve. Put it again in the kettle, and to each gallon of liquid add three and a half pounds of sugar; boil it twenty-five minutes. Tie in a cloth half an ounce of ginger, the same of allspice; put it into the kettle and boil five minutes; then take out the spice. When cool add one teacupful of good yeast; keep it in a warm room to ferment a few days; then put it into a cask with the bung out for three or four months, when it will be ready to bottle. Wine made by this recipe is equal in flavor to port wine, and is far more wholesome for medical purposes than any commercial wine.

Recipe for Brown's Troches.—Pulverized liquorice two and a half ounces; pulverized gum arabic two ounces; pulverized cubebs one ounce; pulverized sugar one pound. Mix thoroughly with a very little water, being careful not to put in too much. Reserve about half of the gum arabic to roll the mass out in. Roll out thin like stiff dough, cut out in any desirable form and dry.

Care of House Plants.—Plants add much to the cheeriness and attractiveness of a room in winter, and to one who loves them, they seem to promote companionship and sympathy.

Dust.—One great enemy to house plants is dust, and all smooth leaved plants, like ivy, cape-jessamine, camellias, etc., should have their leaves washed on both sides in lukewarm water with a soft sponge or cloth. This should be done at least once a week. Rough leaved plants, like geraniums, and some others, cannot be washed to advantage, and these should be set in a sink or bath-tub and have their leaves washed with a watering pot held high up from the plants, so that the water may beat off the dust. When the under side of the leaves are to be washed, turn the pot over on its side, so that the under side of the leaves may be readily reached. Before sweeping, it would be well to cover the plants with a light cloth or newspaper to prevent the dust settling on the leaves.

Insects.—" If one allows insects to get the mastery, the case is difficult; but if the plants as soon as brought in-doors have proper attention, insects need give but little trouble. The three great remedies for insects upon house-plants are—the fingers, tobacco, and water. One who loves plants and watches them, will note the first appearance of scale, mealy-bug, or

other insect large enough to be readily seen, and remove it. Scale may be readily removed by a blunt knife, and mealy-bug may be picked off by a match whittled to a point. Keep a supply of tobacco-water made by pouring boiling water upon tobacco-stems of any cheap kind of tobacco. When used, this is to be diluted, as the rule goes, 'to the color of boarding house tea.' Diluted in this manner it may be showered upon plants infested with plant lice. Preferably, it may be placed in a keg or tub, and the plants infested with insects dipped in it for a few seconds, moving them gently about. The most troublesome of all insects in dry rooms is the red spider, a minute mite which attacks the undersides of leaves. When the leaves of a plant turn brown, red spider is the probable cause. A frequent application of water, as mentioned under dust, is the remedy. In this case, lay the pots on their sides so that the water will reach the under surface of the leaves.

Too Much Water is another lack of success with house plants. If a plant is not in flourishing condition the common remedy is water, and it is watered again and continuously until the soil in the pot is merely mud, in which only the roots of aquatic plants can live. Vastly more house plants are injured by too much than by too little water. There is but one rule for giving water to house plants, that is—give water when it is needed. There should be no indiscriminate daily watering, drenching all alike. It is far better for a plant to get occasionally a little dry, and for its leaves to flag and droop, than to keep its roots soaked by an excess of water. The soil in the pots of house plants should be moist, like that of good garden soil just below the surface. If in this condition no more water is needed. One by observing the soil, its color, and the manner in which it feels when pressed by the finger, can soon learn to judge whether water is needed or not. Another frequent trouble with house plants is

Worms in the Soil.—Every one who cultivates house plants should learn to readily remove the ball of earth from the pot, so that it can be inspected. By exposing the ball, the large earth worms may often be seen upon its surface, and can be picked off. These, as well as smaller worms that sometimes infest the soil, may be readily killed by the use of lime-water. Slake a piece of lime as large as the fist in a pail, and when slaked, fill the pail with water, stir, and let it rest. Use the perfectly clear water upon the soil in the pots.

By observing these precautions as to dust, insects, and watering, the window cultivation of plants will be comparatively easy. Not only for the health of the plants, but of that of the inmates of the dwelling, the air, however heated, should be moistened by proper provision for the evaporation of water.

Even in localities where winters are severe, there are not many days in succession in which the window may not be opened for a short time in the middle of the day. All such opportunities for giving the plants fresh air should be utilized, and what is good for the plants will not injure those who care for them." A little ammonia put in the water for watering plants two or three times a week, will make them thrifty, and grow rapidly.

To Exterminate Bed-bugs, Moths, Cockroaches, Red Ants, etc.—Bed-bugs, Moths, and other insects may be easily exterminated by a free use of benzine. The pure benzine will not soil or injure mattresses or the upholstering of furniture, and may be freely applied; but care should be used not to apply it to painted or varnished woods. Naphtha is of the same nature as benzine, but much more powerful, and when it can be procured is to be preferred. Avoid the use of either benzine or naphtha near a flame, as they are exceedingly volatile. The best method of exterminating red ants, that are such a pest to many housekeepers, is to find the place where they enter the house, if possible, and track them to their nests, which, when found, deluge with boiling water, kerosene oil, or benzine; doing this frequently for a few days will exterminate the entire colony. Some persons have used the oil of pennyroyal with success.

To Remove Fresh Ink Stains from Carpets, etc.—When ink has been spilled upon a carpet, apply as quickly as possible, and before it has time to become absorbed into the meshes, common table salt in sufficient large quantities to absorb the ink. Then sweep it up and apply a new supply of salt, continuing to do so until the salt applied is not soiled by the ink. To remove old or fresh ink stains from white material of any kind, apply oxalic acid, and rinse in warm water; if applied to colored goods it will remove not only the ink stains but other colors also. To remove fruit or tea stains from napkins or other table linen, place the stained parts in an earthen bowl, and turn *boiling* water directly on to them, letting them remain in the water until cold. Be sure the water is *boiling*, as simply hot water will set the stain in, instead of removing it.

To Prevent Lamp Chimneys from Cracking.—The following treatment will not only render lamp chimneys, tumblers, and like articles more durable, but may be applied with advantage to crockery, stoneware, porcelain, etc.: The chimneys, tumblers, etc., are put into a pot filled with cold water, to which some common table salt has been added. The water is well boiled over a fire, and then allowed to cool slowly. When the articles are taken out and washed, they will be found to resist afterward any sudden changes of temperature. The process is simply one of annealing, and the slower the cooling part of it is conducted the more effective will be the work.

How to Clean Lamp Burners.—When lamp burners get gummed, and will not turn the wick up readily, boil them for two or three hours in strong soap suds. They will then turn the wick as readily as when new.

To Renovate Black Silk.—Black silk is restored to its deep black color by sponging it with a strong decoction of cheap black tea. Turn the silk wrong side up, place a thin cloth over it, and smooth out with a moderately hot iron.

To Wash Black Lace.—Put the lace in alcohol, using no water. Squeeze it out, but do not rub it at all. Change the alcohol until it looks clear. Make the last quantity of alcohol pretty blue from common washing bluing or indigo. Squeeze out the lace, fold several thicknesses of cloth on a table, and lay out the lace smoothly to dry, or pin it if necessary to keep it smooth. Do not iron it, but press it between heavy books or other weights when nearly dry.

Sand Bag for the Sick Room.—One of the most convenient articles to be used in a sick room is a sand bag. Get some clean, fine sand, dry it thoroughly in a kettle on the stove, make a bag about eight inches square of flannel, fill with the dry sand, sew the opening carefully together, and cover the bag with cotton or linen cloth. This will prevent the sand from sifting out, and will also enable you to heat the bag quickly by placing it in the oven, or even on top of the stove. After once using this, you will never again attempt to warm the feet or hands of a sick person with a bottle of hot water or a brick. The sand holds the heat a long time, and the bag can be tucked up to the back without hurting the invalid. It is a good plan to make two or three of the bags, and keep them ready for use.

Antidotes for Poisoning.—If poison has been swallowed, try to produce vomiting *immediately*. This can be done at once by giving the patient a tumbler of lukewarm water containing a tablespoonful of ground mustard. Common salt will sometimes answer the place of mustard, if that is not at hand; but the mustard is to be preferred. If the first is not effectual (although it generally is), take a second dose. When vomiting is difficult to accomplish, tickle the back of the throat with the finger, or with a feather, and repeat the use of hot water. In all cases of poisoning, prompt action is very essential. Never wait to send for a physician before relieving the patient. All poisons should be properly labeled and kept under lock and key apart from all other medicines; if this precaution were always taken, fewer deaths by accidental poisoning would occur. Matches should be kept out of the reach of young children, as the phosphorus contained in them is very poisonous.

Arsenic.—If a person has been poisoned with arsenic, administer the mustard water until vomiting is produced; after freely vomiting, give the patient dialyzed iron—a tablespoonful every five minutes until six doses have been taken—or a teaspoonful of sulphur.

Oxalic Acid.—Oxalic acid resembles epsom salts, and is liable to be taken in place of the latter by mistake. The two can be easily distinguished from each other by touching a little to the tongue. Epsom salt has a very *bitter* taste, while oxalic acid is *very sour*. Give a full tablespoonful of either magnesia, pulverized chalk, carbonate of soda, or saleratus, dissolved in water. Use a stomach pump if one is to be obtained.

Sugar of Lead.—For an alkaline poison, such as sugar of lead or acetate of lead, give the mustard emetic as above recommended, together with vinegar and water. This may sometimes be followed with benefit by a dose of either epsom or glauber salts.

Strychnine.—Give to a person poisoned with strychnine an emetic of mustard and warm water, to be followed after vomiting freely by a drink of vinegar and sweet oil. Rich, sweet milk is also good instead of the latter.

Corrosive Sublimate.—When poisoned with corrosive sublimate, give whites of eggs, milk, or oil, as much as the patient can take; then give the mustard water emetic, as previously recommended.

Nitrate of Silver. — When poisoned with nitrate of silver or lunar caustic, give a tablespoonful of common salt in a large tumbler of water, to be followed by castor oil.

Strong Lye. — When strong lye has been swallowed by mistake, as it sometimes is by children, give olive oil or vinegar, or a teacupful of thin, sweet cream. This will neutralize, in a great measure, the effect of the lye. By following it with a mustard emetic, the stomach will be relieved of its contents, although the soap formed by the mingling of the oil and lye, or the acetate of potash by the vinegar and lye, will not materially injure the stomach.

Poisoning by Ammonia. — Perhaps it is not generally known that water of ammonia or hartshorn, if taken in an undiluted state into the stomach, acts as a violent poison. When this accident happens, give vinegar *instantly*, mixed with a little water. This will neutralize the effect of the ammonia, since vinegar is an acid and ammonia is an alkali.

Poisoning from Matches. — Children sometimes become poisoned by eating off the ends of matches, which are composed of very poisonous substances, the principal being phosphorus. Give an emetic of mustard and lukewarm water as quickly as possible, and send for a physician.

Opium, Morphine, Laudanum, etc. — When a person has been poisoned by opium, morphine, laudanum, paregoric, nux vomica, aconite, belladonna, veratrum viride, or croton oil, give an emetic of ground mustard and water immediately, and continue till free vomiting is produced. Then follow with a drink of vinegar and sweet oil. If any of the above poisons produce drowsiness or numbness, rub the body and limbs and soles of the feet with a stiff flesh brush or crash towel. Keep him in the open air, and walking if possible; dash water in his face, etc., to prevent him from sleeping. Strong coffee is said to counteract the effect of some of these poisons.

Poisoning by Dogwood, Ivy, etc. — Bathe in salt and warm water, and afterwards apply a strong tea or decoction of witchhazel bark (Pond's Extract). When the feet and ankles are badly poisoned, as will sometimes be the case with farmers in working in the hay field, we have known great relief to follow covering them entirely for a few hours with freshly-turned soil, the soil seeming to counteract the effect of the poison in a remarkable degree.

Convulsions. — If a child is taken with convulsions, put it instantly into a hot bath (88° to 110° Fah.) to relax the muscles. Be very careful that the water is not too hot. Apply cold water compresses to the head. In fits, loosen all clothing, rub the body and limbs, and give the patient plenty of fresh air.

When Bitten by a Dog. — The first thing to do is to get rid of the poison before it passes into the system. This must be done by burning it out, or by a friend sucking it out, and immediately rejecting the blood taken into the mouth.

Sunstroke. — When a person is attacked with sunstroke, he must be carried into a cool place, and the temperature of the body reduced. This can best be done by undressing him, dashing cold water over him, and applying ice. Sunstroke may be often prevented by abstaining from the excessive use of cold water, wearing loose, light-fitting garments, and paying particular attention not to expose the head to the rays of the sun. If symptoms appear, drop every occupation and retire to the shade.

Articles of Diet for the Sick. — The following recipes for common articles of diet for sick persons, derived from various sources, may be sometimes convenient for reference in the household:

Oatmeal or Indian Meal Gruel. — Mix one or two tablespoonfuls of the meal smoothly in cold water; then stir it in one pint of boiling water, salted with a saltspoon of salt; boil slowly from one to two hours; sweeten afterward, if desired, to suit the taste.

Barley Gruel. — Wash the barley, then put half a teacup in a quart of cold water, let it boil two or three hours. Strain, sweeten to the taste, and flavor with a little grated nutmeg. (Gruels require very thorough cooking.)

Thickened Milk. — Dissolve two tablespoons of flour in a teacup of cold water. Boil one quart of milk in a can within another vessel of water; add the flour and water while the milk is boiling, stir all the while, and boil about ten minutes. Remove it from the fire, flavor with a teaspoon of the essence of lemon or vanilla. Sweeten to the taste.

Panada.—Put two or three soda crackers in a quart bowl; pour boiling water on each cracker slowly until it is swelled out, sprinkle a little sugar over the crackers, and add a cup of boiling water with a tablespoon of wine in it, if the patient requires it. Grate a little nutmeg on the top.

Wine Whey.—Boil half a pint of fresh milk in a porcelain saucepan. The moment the milk rises pour in a small wine-glass of sherry. Let it boil up again, and set the saucepan over on one side of the fire till the curd forms a lump. Do not stir it; the whey will separate from the curd.

Arrowroot.—Two teaspoons of arrowroot will thicken half a pint of milk or water. Dissolve the arrowroot in half a teacup of cold water, and add it by degrees to the half pint of boiling milk or water, stirring over the fire all the while. Boil about five minutes; flavor with essence of vanilla, or wine, and sweeten to the taste; grate a little nutmeg over the top.

Corn-starch or Farina may be used in the same way.

Toast Water is to be used when water is injurious; it satisfies thirst. Toast two slices of bread very brown; do not burn the bread; pour one quart of boiling water over the toast in a pitcher. Let it stand until cool before using.

Cocoa Nibs or Shells.—One quart of boiling water; two ounces of cocoa nibs or shells; one quart of fresh milk; wet the shells or nibs with a teacup of cold water; add the quart of boiling water; when boiling add two tablespoons of white sugar; boil an hour and a half; strain; add the milk which has been heated, and take from the fire. This is excellent for nursing mothers and invalids.

Beef Tea.—Chop fine one pound of beef freed from fat. Cover it with cold water, and let it stand one hour, put it in a large-mouthed bottle, and place the bottle in a pot of cold water, let it boil slowly for two hours, until the juice is all extracted from the meat; season with a little salt.

Beef-juice and Wine (for very weak patients).—Take the tenderloin of a beefsteak, and warm it before the fire on a wire gridiron, cut it to pieces, and express the juice with a lemon squeezer; put the juice in a wineglass of good wine. Give a teaspoonful at a time.

Chicken Broth.—A chicken weighing two pounds will make a quart of broth. Cut the chicken to pieces and break all the bones; pour on a quart of cold water, let it simmer from half to three-quarters of an hour, or until the meat is separated from the bones; strain it and put in a tablespoon of barley which has been cooked in a little warm water, add a pinch of salt. Some like half a cup of wine added: in this case return it to the fire and let it simmer five minutes longer, taking care that it does not burn.

Lamb and Mutton Broth can be made in the same way.

Chicken Jelly.—Take one chicken, and after having washed it thoroughly in cold water, cut the chicken to pieces and pound it until all the bones are broken, then place the chicken in a saucepan with enough water to cover it—about a quart. Heat it slowly in a covered vessel, and let it simmer slowly until the meat is in white shreds and the liquor is reduced to one-half. Strain and press, first through a colander and then through a coarse cloth, salt it to the taste, and return it to the fire: let it come to a boil and simmer five minutes, skim when cool; pour into a jelly mold, and it is ready for use. Keep it on the ice.

Wine Jelly.—Half a box of Cox's gelatine, pour on this quantity half a pint of cold water; let it stand one hour; then add one pint of boiling water, and half a pint of wine, and one teacup of powdered sugar. Strain through muslin, and pour it into molds that have been wet with hot water.

Lemon Jelly is made in the same way, only use the juice and rind of two lemons instead of the wine. Grate the lemon, and allow the rind to soak in a cup of hot water for half an hour.

Rice Jelly.—Half a cup of whole rice washed and soaked two hours in warm water. Add three pints of cold water, and cook the rice to a smooth paste, and the water is reduced to two pints. Strain it through barred crinoline, and season it with a little salt, and sweeten to the taste with granulated sugar. This is excellent for children with bowel complaint.

Barley Water (for sick children).—Two tablespoons of pearl barley cleansed, two cups of boiling water, one pinch of salt, and two teaspoons of white sugar; soak the barley half

an hour in a teacup of warm water, stir it without draining into the boiling water. Let it simmer for an hour, stirring often. Strain it before adding the sugar.

Stewed Oysters (for one person).—Open and drain the liquor from six oysters; mix a tablespoon of hot water with the juice, add a little salt and pepper; boil five minutes; skim off the froth, put in the oysters, let them boil *five* minutes, *not more;* add a teaspoon of butter; the moment it is melted remove from the fire and add a half cup of milk which has been boiled when the oysters were stewing.

Clam Broth (for one person).—Drain off a cup of juice from the clams, add half a teacup of hot water, season with a little salt and pepper; let it boil five minutes, skim, throw in the clams, let them stew fifteen minutes, take them out and add a soda cracker which has been rolled into a powder.

Hoarseness.—The best remedy for hoarseness with which we are familiar, and also to relieve a cough caused by an irritation in the throat, is to take a frequent dose of the following simple remedy: Add to good sharp cider vinegar a sufficient quantity of loaf sugar to make it, when dissolved, of the consistency of thin syrup; then sift in enough cayenne pepper to make it leave a burning sensation in the throat when used; take a small swallow to moisten the throat occasionally. Lemon juice may be used in place of vinegar.

Sore Throat.—Gargling with salt and water, camphor and water, or with a solution of chlorate of potash, is excellent for a sore throat. When the throat is swollen and much inflamed a mustard poultice or a poultice of part mustard and part ginger should be applied externally.

Wonderful Liniment.—Two ounces of oil of spike, 2 of organum, 2 of hemlock, 2 of wormwood, 4 of sweet oil, 2 of spts. ammonia, 2 of gum camphor, 2 of spts. turpentine, and one quart of pure cider brandy; mix well together and bottle tight.

This liniment is excellent for sprains, bruises, lameness, etc., etc., in horses. Omit the turpentine and you have one of the best liniments ever made for human ails, such as rheumatism, sprains, etc., whenever an outward application is required.

Opodeldoc.—Take alcohol half a gallon, 2 pounds of castile soap, 4 oz. of gum camphor, 2 oz. of oil of ambre, place the alcohol into a pot in hot water, shave up the soap and keep it hot until all dissolves, and you have the old original opodeldoc.

Staining Wood.—To stain wood brown, use a concentrated solution of potassium permanganate in water. Red—boil ¼ lb. of logwood and ½ oz. of soda in a pint of water; apply hot, and then go over the work with a strong aqueous solution of alum. Rose—potassium iodide in 12 parts of water for first bath; as second, mercuric chloride (corrosive sublimate) in 40 parts of water. Indigo solutions give blue washes. Wood dipped in concentrated hot solution of copper sulphate, and then in solution of washing soda, becomes light blue. Verdigris dissolved in 4 parts of vinegar imparts a good green color to dry wood. Turmeric dissolved in wood naphtha produces a yellow wash. Aqua regia (nitro-muriatic acid), when diluted with 3 parts of water, though somewhat destructive, is often used on light woods for a strong yellow.

For ebonizing wood, Brazil wood, powdered nutgalls and alum are boiled in water until a blackish color is obtained; the liquid is filtered and applied to the wood, which is then washed in a liquor made by digesting strong vinegar and a little oil of vitriol for some time with excess of iron turnings; thoroughly wash the wood, dry, and oil.

For staining fine woods of a rich, dark color, the following is applicable: Four ounces of gallnuts, 1 ounce of powdered logwood, ½ ounce of green vitriol, and ½ ounce of verdigris are boiled with water, and the solution, filtered hot, is applied to the wood, which is then coated with a solution of 1 ounce of fine iron filings, dissolved by digestion in a small quantity of hot wine vinegar.

Some of the finest effects are now produced in the toning or darkening of woods for decorative purposes—logwood, lime, brown soft soap, dyed oil, sulphate of iron, nitrate of silver exposed to sun's rays, carbonate of soda, bichromate and permanganate of potash, and other alkaline preparations being employed to this end. The art is simple. The solution is applied by dissolving one ounce of the alkali in two gills of boiling water, diluted to the required tone; the surface is saturated with a sponge or flannel, and immediately dried with soft rags. The carbonate is used for dark woods; oil tinged with rose madder may be applied to hard woods like birch, and a red oil is prepared from soaked alkanet root in linseed oil; the grain of yellow pine is brought out by two or three coats of japan much diluted

with turpentine and afterwards oiled and rubbed. To give mahogany the appearance of age, lime water, used before oiling, is effective. In staining woods the best and most transparent appearance is obtained by repeated light coats of the same; for oak stains a strong solution of oxalic acid is employed, and dilute nitrous acid for mahogany.

Periods of Gestation of Domestic Animals.—The minimum and maximum periods of gestation in domestic animals are as follows:

	Days.		*Average.*		*Days.*		*Average.*
In the mare, . . .	300 to	400	340	In the dog, . . .	55 to	70	63
" " cow, ...	220	320	280	" " cat, . . .	50	64	55
" " sheep and goat, .	143	156	150	" " rabbit, . . .	28	30	30
" " pig, ...	104	127	120				

How Long Animals Live.—The average age of cats is fifteen years; of squirrels and hares seven to eight years; rabbits seven; a bear rarely exceeds twenty years; a dog lives twenty years, a wolf twenty, a fox fourteen to sixteen; lions are long-lived, the one known by the name of Pompey living to the age of seventy. Elephants have been known to live to the great age of four hundred years. When Alexander the Great had conquered Porus, King of India, he took a large elephant which had fought valiantly for the king and named him Ajax, dedicating him to the sun, and letting him go with this inscription, "Alexander, son of Jupiter, dedicated Ajax to the sun." The elephant was found with the inscription 340 years after. Pigs have been known to live to the age of twenty, and the rhinoceros to twenty-nine; a horse has been known to live to the age of sixty-two, but averages twenty-five to thirty; camels sometimes live to the age of one hundred; stags are very long-livers; sheep seldom exceed the age of ten; cows live about fifteen years. Cuvier considers it probable that whales sometimes live to one thousand years. The dolphin and purpoise attain the age of thirty; an eagle died at Vienna at the age of 104; ravens frequently reach the age of 100; swans have been known to live 300 years. Pelicans are long-lived. A tortoise has been known to live to the age of 107 years.

Useful Tables for the Farmer and Gardener.—Estimate of Seeds for an Acre.

	Pounds.
Beets and Mangel Wurzel, . . .	4 to 6
Cabbage, ...	1 to 1½
Carrot, ...	2 to 3
Cucumber in hills, ...	1 to 2
Clover, red, broadcast alone, . . .	15 to 20
Clover, sown on grain in Spring, mixed with ¼ bushel Timothy and 1 bushel Red Top, ...	10
Clover, white, broadcast alone, . .	10 to 15
Clover, white, in drills, . . .	8
Lucerne, broadcast, ...	15
Onion, in drills.	5
Parsnip, in drills, ...	4 to 6
Radish, in drills, ...	5 to 8
Radish, broadcast, ...	12 to 16
Salsify, in drills, ...	6 to 8
Spurry, broadcast, ...	26
Spinach, ...	8 to 10
Tomato, ...	1 oz. to 5,000 plants.
Tobacco, ...	1 oz. to 10,000 "
Turnip and Ruta Baga, broadcast, .	1½
Turnip and Ruta Baga, in drills, .	1
	Quarts.
Beans, pole, in hills 3½ x 4, . .	8 to 12
Corn, in hills, ...	8 to 12
Broom Corn, in hills, ...	10 to 12
Millet for seed, ...	12

	Quarts.
Mustard, broadcast, ...	12
Sorghum, or Chinese Sugar Cane, .	2 to 3
	Bushels.
Beans, bush in drills, 2½ feet apart, .	1½
Corn for fodder, ...	3 to 4
Barley, broadcast, ...	2 to 3
Barley, in drills, ...	1¾ to 2
Buckwheat, ...	1 to 1½
Hungarian Grass, ...	½
Kentucky Blue Grass, ...	2 to 3
Lawn Grass, ...	2 to 3
Millet, broadcast, ...	½ to ¾
Oats, ...	2 to 3
Orchard Grass, ...	2 to 3
Pease, early, in drills, ...	2 to 3
Pease, Marrowfat, ...	1¼ to 2
Potatoes, in drills or hills, cut tubers, .	10
Potatoes, cut to single eyes, . .	3 to 5
Rye, broadcast, ...	1½ to 2
Red Top, ...	2 to 3
Rye Grass	2
Rhode Island Bent, ...	2 to 3
Sainfoin, ...	2 to 3
Timothy, ...	½
Vetches, ...	2 to 3
Wheat, broadcast, ...	1½ to 2
Wheat, in drills, ...	½

To Measure Corn in Cob.—Two heaping bushels of corn on the cob will make one struck bushel of shelled corn. Some claim that one and one-half bushels of ear will make one bushel of shelled corn. Much will depend on the kind of corn, shape of the ear, size of the cob, etc.

In Crib.—To measure corn in a crib, multiply the length of the crib in inches by the width in inches, and that by the height of the corn in the crib in inches, and divide the product by 2,748, and the quotient will be the number of heaped bushels of ears. If the

crib flares at the sides, measure the width at the top and also at the bottom, add the two sums together, and divide the two, which will give the mean width.

A Firkin of Butter was formerly 56 lbs., but it is now generally put up in 50 or 100 lb. firkins.

A Bale of Cotton is 400 lbs., but it is put up in different States varying from 280 to to 720 lbs. Sea Island cotton is put up in sacks of 300 lbs.

Measurement of Hay.—The only exact method of measuring hay is to weigh it, but the rules given below will be found sufficient for ordinary practical purposes.

To Find the Number of Tons of Meadow Hay in Windrows.—Multiply together the length, in yards, and divide the product by 25. The quotient will be the number of tons in the windrow.

To Find the Number of Tons of Hay in a Mow.—Multiply together the length, height, and width, in yards, and divide by fifteen, if the hay be well packed. If the mow be shallow, and the hay recently placed therein, divide by 18, and by any number from 15 to 18, according as the hay is well packed.

To Find the Number of Tons of Hay in Square or Long Stacks.—Multiply the length of the base in yards by the width in yards, and that by half the height in yards, and divide by 15.

To Find the Number of Tons of Hay in a Load.—Multiply together the length, width, and height, and divide the product by 20. To ascertain the value of a given number of lbs. of hay, straw, or other commodity sold by the ton, at a given price per ton, multiply the number of lbs. by one-half the price per ton, and point off three figures from the right. The result will be the price of the article.

To Measure Stone and Brick Walls.—A perch of stone is 24.75 cubic feet. When built in the wall, $2\frac{3}{4}$ cubic feet are allowed for the mortar and filling; hence, 22 cubic feet of stone make one perch of wall. Masons estimate 3 pecks of lime and 4 bushels of sand to a perch of wall. To find the number of perches of stone in a wall, multiply together the length, height, and thickness in feet, and divide by 22. Common bricks are $7\frac{3}{4}$ to 8 inches long by $4\frac{1}{4}$ wide and $2\frac{1}{2}$ thick. Front bricks are $\frac{1}{4}$ inch longer and wider. It requires 20 common bricks to lay one cubic foot. In an 8-inch wall 15 common bricks make one foot of wall. To find the number of bricks in a wall 12 inches or more in thickness, multiply together the length, height, and thickness in feet, and that again by 20. For an 8-inch wall, multiply the length by the height, and that by 15, and the product will be the number of bricks in the wall. If the wall is perforated by openings, such as doors, windows, etc., multiply the length of such openings by the width, and that by the thickness, and deduct from the cubic contents of the wall before multiplying by 15 or 20 as above.

To Measure Land.—If the field be a square or parallelogram, multiply the length in rods by the width in rods, and divide by 160, the number of square rods in an acre. If the field is triangular, multiply the length of the longest side in rods by the greatest width in rods, and divide half the product by 160. If the field be of irregular shape, divide it into triangles, and find the acreage of each triangle as above. All straight-sided fields can be thus measured. Where the sides are crooked and irregular, take the length in rods in a number of places at equal distances apart, add them, and divide by the number of measurements, which will give the mean length; proceed similarly with the width, multiply the mean length by the mean width, and divide by 160. Where the field is in a circle, find the diameter in rods, multiply the square of the diameter by 7,854, and divide by 160.

To Lay out an Acre in Rectangular Form.—An acre of land contains 160 square rods, or 43,560 square feet. Hence, to lay out an acre at right angles (square corners), when one side is known, divide the units in the square content by the units of the same kind in the length of the known side. Thus: if the known side be 4 rods, divide 160 by 4, and the quotient 40 will be the depth of the acre-plot. If the length of the known side be 90 feet, divide 43,560 by 90, and the quotient 48 will be the depth of an acre-plot.

Measurement of Wood and Lumber.—A cord of wood contains 128 cubic feet. To ascertain how many cords there are in a pile of wood, multiply the length by the height, and that by the width, and divide the product by 128. To ascertain the circumferences of a

tree required to hew a stick or timber of any given number of inches square, divide the given side of the square by .225, and the quotient is the circumference required. Round timber, when squared, loses one-fifth. To measure round timber take the girth in inches at both the large and small ends, add them, and divide by 2, which gives the mean girth; then multiply the length in feet by the square of one-fourth of the mean girth, and the quotient will be the contents in cubic feet. This rule is commonly adopted, and gives four-fifths of the true contents, one-fifth being allowed to the purchaser for waste in sawing.

To Measure Inch Boards.—Multiply the length in feet by the width in inches, and divide the product by 12. The quotient will be the contents in feet. For lumber $1\frac{1}{4}$ inches thick, add $\frac{1}{4}$ to the quotient. If $1\frac{1}{2}$ inches thick, add $\frac{1}{2}$. If $1\frac{3}{4}$ inches thick, add $\frac{3}{4}$. If 2 inches thick, divide by 6 instead of by 12. If $2\frac{1}{4}$ inches thick, add $\frac{1}{4}$ to the quotient, and so on. If 3 inches thick, divide by 4. If 4 inches thick, divide by 3. If 6 inches thick, divide by 2. To ascertain the contents (broad measure) of timber, multiply the width in inches by the thickness in inches, and that by the length in feet, and divide the product by 12. The result will be the number of feet. To ascertain how many feet of lumber can be sawed from a log, from the diameter of the log in inches substract 4; one-fourth the remainder squared and multiplied by the length of the log in feet will give the correct amount of lumber that can be sawed from the log.

MEASURES OF AN ACRE PLOT.

Either of the following measures include about an acre plot:

3 by 53 1-8 rods.	8 by 20 rods.
4 by 40 "	9 by 17 7-8 "
5 by 32 "	10 by 16 "
6 by 26 2-3 "	11 by 14 6-11 "
7 by 22 6-7 "	12 by 13 1-3 "

12 rods 10 feet and $8\frac{1}{2}$ inches square make an acre.

To Measure Grain in Bins.—Multiply the length of the bin in inches by the width in inches, and that by the height in inches, and divide by 2150 for struck bushels, and by 2748 for heaped bushels. The quotient will be the number of bushels contained in the bin.

To Compute the Weight of Cattle.—Multiply the girth in inches, immediately back of the shoulders, by the length in inches from the square of the buttock to the point of the shoulder blade, and divide the product by 144, which will give the number of superficial feet. If the animal has a girth of from 3 to 5 feet, multiply the number of superficial feet by 16, which will give the weight of the animal. If the girth is from 5 to 7 feet, multiply by 23, and if from 7 to 9 feet, multiply by 31. If less than 3 feet girth, as in the case of small calves, hogs, sheep, etc, multiply by 11. Of course many circumstances, such as the build of the animal, mode of fattening, condition, breed, etc., will influence the weight, but the above will be found approximately correct.

Weight of a Bushel of Produce.—The number of pounds in a bushel of the various articles of produce varies somewhat in the different States. The majority, however, have adopted the following:

	lbs.		lbs.
Apples (dried),	28	Indian corn,	56
Barley,	48	" " (in ear),	68
Buckwheat,	42	" " (meal),	50
Beans,	60	Oats,	32
Beans (castor),	46	Onions,	57
Coal (mineral),	80	Peaches (dried),	28
Charcoal (hard wood),	30	Pease,	60
Flax seed,	56	Potatoes,	60
Grass seed (blue),	14	Rye,	56
Grass seed (clover),	60	Rye (meal),	50
Grass seed (timothy),	45	Salt,	50
Hemp seed,	44	Wheat,	60

Rules for Computing Interest, giving Convenient Formula, Rules, and Tables for Computing Interest.—The *rate per cent.* differs in some States from that of others. For complete list of such rates per cent., compiled from authorized sources, see page 930.

CONVENIENT FORMULAS.

Principal + rate % = interest for one year.

Principal + rate % + time, (in years and decimals of a year) = interest for such time.

To Compute Interest when Partial Payments have been made.

United States Rule.—1. *Find the interest and amount of the principal to the time of the first payment: if the payment is greater than the interest, subtract the payment from the amount, and treat the remainder as a new principal.* II. *If the payment is less than the interest, find the amount of the note to the time when the sum of the payments shall exceed the interest due, subtract the sum of the payments from the amount, and proceed as before.*

This rule was founded upon the decision of Chancellor Kent. The principle is that neither interest nor payment shall draw interest. It has been adopted by nearly all the States —New Hampshire, Vermont, and Connecticut being the principal exceptions. In Connecticut, the Supreme Court has adopted the following principles in the calculation of interest:

I. *Payments made when interest has run a year or more, and those less than the interest are treated as in the U. S. rule.* II. *A payment made within a year from the beginning of any interest draws interest for the rest of that year, if that year does not extend beyond settlement; and its amount must be taken from the amount of the principal for that year. But if the year does extend beyond settlement, the amounts are computed for both principal and payment, to settlement. The difference of these amounts is the balance due.*

In some States, as in Vermont and New Hampshire, what is called *annual interest* is allowed; that is, if *interest* is not paid when due, it will bear *simple interest.*

Commercial or Merchants' Rule.—*Find the amount of the principal at the time of settlement. Then find the amount of each payment from the time it was made until settlement, and subtract the sum of the amounts of the payments from the amount of the principal.*

TIME REQUIRED FOR DIGESTING FOOD.

Food.	How Cooked.	H. M.	Food.	How Cooked.	H. M.
Apples, sour, mellow	Raw	2.00	Milk	Boiled	2.00
Apples, sour, hard	Raw	2.50	Milk	Raw	2.15
Apples, sweet, mellow	Raw	1.30	Mutton, fresh	Broiled	3.00
Bass, striped	Broiled	3.00	Mutton, fresh	Boiled	3.00
Beans, pod	Boiled	2.30	Mutton, fresh	Roasted	3.15
Beans and green corn	Boiled	3.45	Oysters, fresh	Raw	2.55
Beef	Fried	4.00	Oysters, fresh	Roasted	3.15
Beefsteak	Broiled	3.00	Oysters, fresh	Stewed	3.30
Beef, fresh, lean, dry	Roasted	3.30	Parsnips	Boiled	2.30
Beef, fresh, lean, rare	Roasted	3.00	Pig, sucking	Roasted	2.30
Beets	Boiled	3.45	Pigs' feet, soused	Boiled	1.00
Brains, animal	Boiled	3.45	Pork steak	Broiled	3.15
Bread, corn	Baked	3.15	Pork, fat and lean	Roasted	5.15
Bread, wheat, fresh	Baked	1.30	Pork, recently salted	Stewed	3.00
Cabbage	Raw	2.30	Pork, recently salted	Broiled	3.15
Cabbage, with vinegar	Raw	2.00	Pork, recently salted	Fried	4.15
Cabbage	Boiled	4.30	Pork, recently salted	Boiled	4.30
Carrot, orange	Boiled	3.13	Potatoes, Irish	Roasted	2.30
Catfish	Fried	3.30	Potatoes, Irish	Baked	2.30
Cheese, old, strong	Raw	3 30	Potatoes, Irish	Boiled	3.30
Chicken, full grown	Fricasseed	2.45	Salmon, salted	Boiled	4 00
Codfish, cured dry	Boiled	2.00	Sausages, fresh	Broiled	3.20
Custard	Baked	2.45	Soup, barley	Boiled	1 30
Duck, tame	Roasted	4.00	Soup, bean	Boiled	3.00
Duck, wild	Roasted	4.30	Soup, chicken	Boiled	3.00
Eggs, fresh	Raw	2.00	Soup, mutton	Boiled	3.30
Eggs, fresh	Whipped	1.30	Soup, oyster	Boiled	3.00
Eggs, fresh	Roasted	2.15	Soup, beef, vegetables	Boiled	4.00
Eggs, fresh	Soft boiled	3.00	Soup, marrow bones	Boiled	4.15
Eggs, fresh	Hard boiled	3.30	Tripe, soused	Boiled	1.00
Eggs, fresh	Fried	3.30	Trout, salmon, fresh	Boiled	1.30
Fowls, domestic	Roasted	4.00	Trout, salmon, fresh	Fried	1.30
Fowls, domestic	Boiled	4.00	Turkey, wild	Roasted	2.18
Gelatine	Boiled	2.30	Turkey, domesticated	Roasted	2.30
Goose, wild	Roasted	2.30	Turkey, domesticated	Boiled	2.25
Hashed meat and vegetables	Warmed	2.30	Turnips	Boiled	3.30
Heart, animal	Fried	4.00	Veal, fresh	Boiled	4.00
Lamb, fresh	Broiled	2.30	Veal, fresh	Fried	4.30
Liver, beeve's, fresh	Broiled	2.00	Venison steak	Broiled	1.35

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